Allowing Failure

as an Unspoken Pedagogy in Residency Training

Jennifer Margaretha Klasen

Allowing Failure
as an Unspoken Pedagogy in Residency Training

DISSERTATION

To obtain the degree of Doctor at Maastricht University, on the authority of the Rector Magnificus, Prof. dr. Pamela Habibović
in accordance with the decision of the Board of Deans,
to be defended in public on Thursday 7 March 2024, at 10.00 hours

By

Jennifer Margaretha Klasen

The research reported here was carried out at Maastricht University | Maastricht UMC+

Maastricht University | Maastricht UMC+

in the School of Health Professions Education

SHE School of Health Professions Education

Allowing Failure
as an Unspoken Pedagogy in Residency Training

ISBN
978-94-93330-61-0

Cover, design/lay-out and print
Promotie In Zicht | www.promotie-inzicht.nl

SUPERVISORS

Prof.dr. Erik Driessen

Prof.dr. Lorelei Lingard, University of Western Ontario, Canada

Prof.dr. Pim Teunissen

ASSESSMENT COMMITTEE

Prof.dr. Desirée Joosten-ten Brinke (Chair)

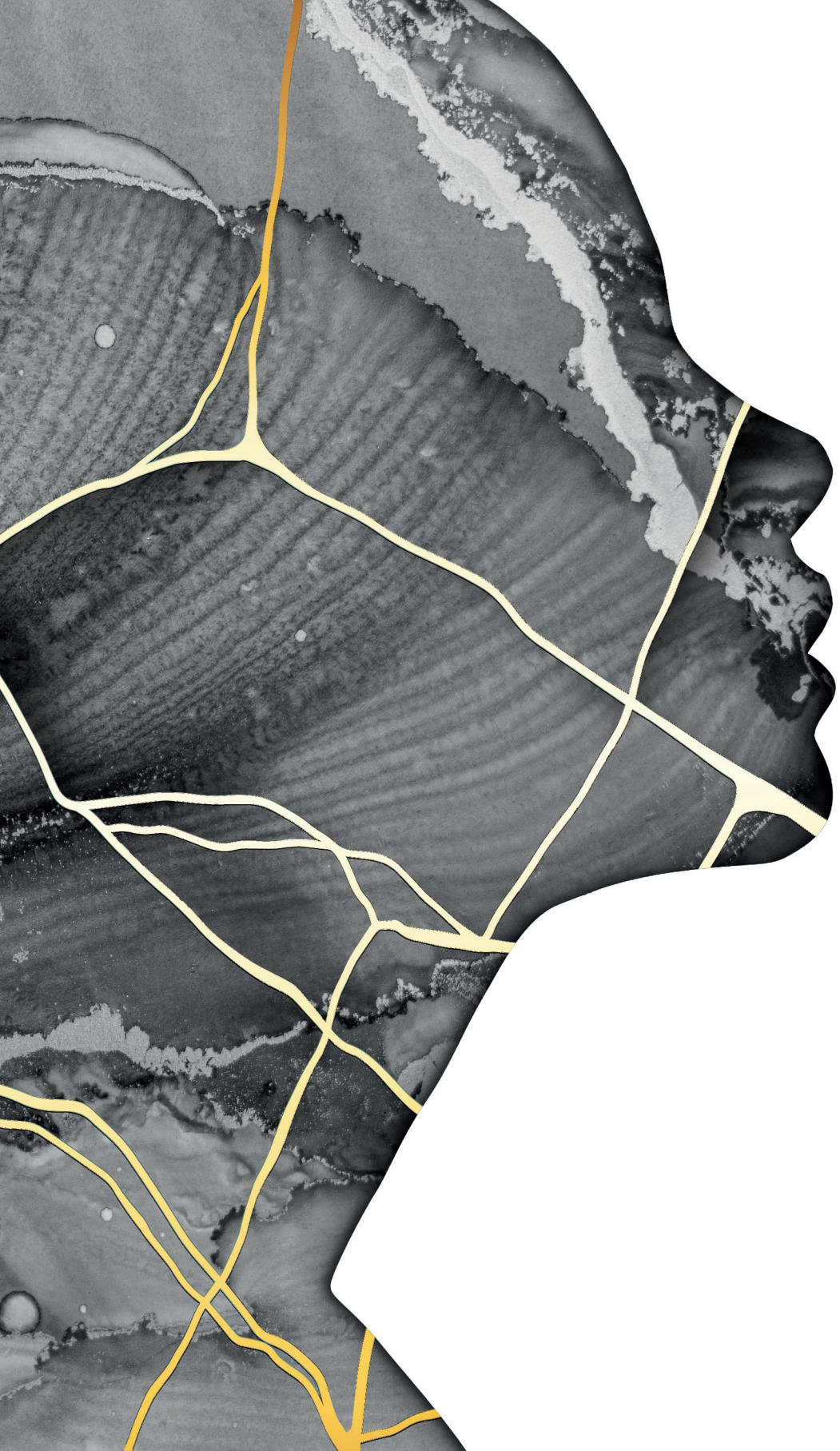
Prof.dr. Dorene Balmer, University of Pennsylvania, USA

Prof.dr. Marco de Carvalho Filho, UMC Groningen

Prof.dr. Piet Leroy

Dr. Renée Stalmeijer

Table of Contents



1

Introduction

1.1 Introduction

Failure is a rather dreadful word. In its generic definition, failure means the "omission of occurrence or performance," the inability of a performer to function, or "a lack of success."[1] Therefore, failure tends to be associated with negative outcomes; it is a word used for a situation in which a machine or system stops working with a potentially disastrous outcome. The power industry, for instance, calls the disintegration or collapse of a component or structure that results in loss of vital function which impairs safety a "catastrophic failure."[2] As clinicians, we often use "failure" to describe acute or chronic loss of function of an organ that may lead to potentially life-threatening complications. A patient needs dialysis because of renal failure, suffers from liver failure, or dies of heart failure. In clinical situations, where first and foremost we are to 'do no harm', failure sounds suspiciously like doing harm and it provokes disturbing emotions. Failure, thus, reeks of bad connotations.

What these definitions and connotations miss is the powerful potential of failure to influence learning. The path to becoming an autonomous physician is paved by navigating failures and learning from them. Failure in the complex, high stakes practice of medicine is unavoidable,[3] and therefore trainees need (safe) opportunities to fail under supervision so that they develop recovery strategies they can access when they fail during independent practice.[4,5] Experiencing failure is also important for learning to handle the emotional consequences of failure in practice, which can impair well-being if healthcare providers are unprepared for these consequences.[6] However, while there is a growing body of literature on the impact of medical errors on physicians and especially trainees as "second victims", [7–10] there is a lack of research on how to optimize learning from failure in the clinical environment. This gap may be due in part to the strong culture of patient safety in medicine, which creates a hesitancy to acknowledge that failure can be a valuable learning experience.

Supervisors play a key role in optimizing learning from failure. Of course, trainees may also fail when they're not being supervised in an appropriate manner,[11–15] but the research focus of this thesis is on those moments when supervisors anticipate a trainee failure and allow it to happen to support trainee learning. Thus, we consider the potential of allowed failure as a "pedagogy" in this dissertation, by which we intend a purposeful educational method or practice. Supervisors using this pedagogy have to strike a delicate balance between their two primary roles of supporting learning and ensuring optimal patient care.[16–19]

This doctoral thesis aims to explore the social phenomenon of allowing failure in the clinical environment. Specifically, this research program is designed to gain a deeper understanding of the nature and scope of this practice by examining the various factors that affect clinical supervisors' judgment of when failure is sufficient to promote trainee learning but is not so great as to affect patient outcome. This exploration intends to create foundational knowledge that can be used, for instance by clinical supervisors, to create an environment that supports the careful use of failure while ensuring patient safety. It also investigates the emotional consequences of failure for trainees, and the impact of failure on trainees' learning and development towards autonomy. To achieve this goal, this research explores different views of different stakeholders about this educational approach.

Before laying out more precisely the scope and design of the research program, I will characterize how failure has been recently conceptualized in other educational and non-educational fields, with an emphasis on how these concepts may inform the understanding of allowing failure in the clinical setting.

1.2 Understanding failure as a concept for learning

Outside the clinical training environment, the educational power of learning from failure is well accepted. Educational activities are carefully structured to provoke learner failure in order to drive learning and cultivate resilience.[20–22] This literature recognizes that the educational strategy of allowing failure is a complex phenomenon: scholars acknowledge that making mistakes helps the learner to attain progressive independence,[23,24] but caution that it is critically important to understand what a learner already knows[25] and to have an optimal supervisory relationship.[26]

Key concepts related to the role of failure in the cognitive aspects of learning are "*desirable difficulties*", "*challenge point framework*", and "*productive failure*". These three concepts offer valuable insights into how failure can be leveraged to optimize learning outcomes. *Desirable difficulties* refer to learning conditions that introduce challenges and obstacles intentionally to enhance long-term learning and retention.[27] In the context of health professions education, *desirable difficulties* can be incorporated through techniques such as spacing out learning sessions, interleaving different topics, and providing varied practice opportunities. These approaches foster deeper cognitive processing, as learners are compelled to actively engage with the material, make connections, and overcome obstacles.

While *desirable difficulties* may lead to short-term performance decrements and frustration, they promote enhanced understanding, critical thinking, and the ability to apply knowledge effectively. The *challenge point framework* offers a theoretical model to understand the relationship between task difficulty, learner ability, and performance.[28] According to this approach, optimal learning occurs when the level of challenge matches the learner's current ability.[29] Tasks that are too easy result in minimal cognitive engagement and limited learning, while tasks that are excessively difficult can lead to overwhelming stress and hinder learning. By identifying the challenge point, educators can tailor the learning environment to provide appropriate levels of difficulty that stretch learners' capabilities without overwhelming them. The *challenge point framework* emphasizes the importance of failure as an indicator of reaching the boundaries of one's competence, prompting growth and improvement. Incorporating *desirable difficulties* and utilizing the *challenge point framework* enables educators to optimize the learning process and promote deeper understanding. *Productive failure* emphasizes the acceptance and even encouragement of failure as a natural and necessary part of the learning and growth process.[30,31,22] This concept presents the idea that by struggling and failing in a controlled and supportive environment, learners can develop deeper understanding and problem-solving skills than if they had simply been given the correct answers from the outset.[25] Such research comes from different pedagogical areas such as early childhood education, learning sciences and higher education, driven by Manu Kapur. According to his studies on *productive failure*, students gain more from trying a task, failing, and learning from that failure than they do from completing it successfully on the first attempt.[22] This strategy also emphasizes the importance of resilience and self-reliance and encourages students to take ownership of their learning and to use *productive failure* to develop the skills needed for their learning success.[32,33]

Kapur's research has been influential in the education sector and has shifted the focus from simply getting the answers right to understanding and learning from failure. Educators serve as facilitators and guides, creating a safe and supportive learning environment where students can take risks and experience failure without fear. They set clear learning goals and expectations, design challenging and engaging learning experiences, and provide structured feedback and support while productive failure is used. They also promote reflection and metacognitive skills, encouraging students to analyze their failures, identify areas for improvement, and develop effective strategies.[34]

Steenhof translated this knowledge into pre-clinical health professions education by using *productive failure* to help first-year pharmacy students develop their problem-solving and critical thinking skills in a challenging, paper-based, clinically relevant problem.[35] Steenhof's approach in medical education has shown promising results in improving students' retention and application of knowledge in practice, making it a valuable tool for educators across various fields. Her research also promotes the use of deliberate practice and authentic assessment, which allows students to gain a deeper understanding of medical concepts.[36] According to Steenhof, productive failure can be viewed as an instructional design strategy that asks learners to attempt to generate solutions to difficult problems before receiving instruction and has the potential to foster the development of adaptive expertise or support long-term learning. In this setting, similar to Kapurs' productive failure, educators might be seen more as a coach than an instructor, who guide the learner through the instructional setting.

A similar argument for the impact of errors on enhancing learning comes from the human resource development literature. Assuming that failure is inevitable in any complex environment and that institutions and individuals can benefit from embracing them as opportunities for learning and improvement, the Prevention-Permission-Promotion Framework describes three approaches to errors during learning.[20] First, the "error prevention" approach teaches learners to avoid making errors and only observe errors when they occur. Second, the "error permission" approach allows errors to occur naturally during learners' exploratory activities, supported by corrective feedback. Third, the error promotion approach even goes a step further, where learners are actively induced or guided to make errors. Both, error permission and error promotion, derive from "low stakes" contexts, such as paper-based exercises or simulation-based learning activities. Based on this framework, Wong has innovated the counterintuitive learning strategy of *deliberate erring*, in which learners are guided to intentionally commit and correct errors in lower-stakes contexts in the undergraduate non-clinical student setting. Wong's research program showed that deliberate erring in classroom settings improves learning more than avoiding errors — a phenomenon that she called the *derring effect*.[21] The benefits of deliberate erring across diverse educational outcomes were seen in memory retention,[37] knowledge application,[21] and far transfer of learning across different knowledge domains.[38]

Other areas have started to embrace learning from failure. In business administration, for instance, failure is appreciated for improvement and innovation. There, failure may be approached as inevitable, an opportunity for learning, as well as a

chance for improvement and innovation.[39] Edmondson encourages organizations to embrace failure by creating an environment that promotes open dialogue and experimentation and by recognizing that failure is a normal part of the process.[40] In this regard, organizations should create an environment where employees can take risks without fear of retribution and provide resources and support to those who fail. By doing so, organizations can create an environment where failure is seen as an opportunity rather than something to be avoided or punished. In this context, psychological safety, the belief that an individual can take risks and be vulnerable without fear of ridicule or punishment has to be created.[41] Edmondson also encourages healthcare organizations to create such an environment so that health care providers feel safe to talk about mistakes in order to learn from it.[42]

In general, the literature outside medicine suggests that failure can be a powerful catalyst for learning and growth, but it also reminds us that it is essential to strike a balance between the severity of failure and the value of learning. Not all failures automatically lead to learning, so it is crucial to evaluate the context and nature of the failure to determine its potential for generating valuable insights. Firstly, it is important to consider the controllability of the failure. Failures caused by external factors or unforeseen circumstances may not offer significant lessons to be learned. For instance, if failure happens because of sudden changes or an unexpected natural disaster, failure might be attributed to factors beyond anyone's control.[43] In such cases, it may be necessary to recognize that failure alone does not always guarantee meaningful learning. However, failures resulting from controllable factors, such as human error, flawed decision-making, or lack of preparation, present rich opportunities for learning. Second, reflective analysis of the involved stakeholders seems to play a crucial role in extracting lessons from failure.[39,40] Engaging in introspection and critically examining the causes and consequences of the failure can help identify patterns, behaviors, and decision-making processes that contributed to the outcome. By understanding these underlying factors, individuals can pinpoint areas for improvement and develop strategies to avoid similar failures in the future. Third, when individuals feel safe to share their failures and openly discuss them without fear of judgment or negative consequences, a positive learning experience can be fostered.[41] Such a supportive environment, which includes an atmosphere to "speak up," collaboration and feedback, might depend on the institutional and personal acceptance of the potential of failure to unlock learning and improvement. The various factors are not mere isolated but are rather intricately interconnected, forming a complex net of relationships that significantly impact the overall outcome. This interdependence underscores the

importance of understanding the multifaceted nature of these factors and how they dynamically interact with one another.[44]

While it is important to embrace failures as learning opportunities, it is equally important to avoid dwelling excessively on them. The balance lies in acknowledging failures, extracting valuable lessons, and then moving forward with renewed knowledge and determination. Failure may be seen as part of an iterative process where adjustments and refinements are made based on the lessons learned. This iterative approach allows for continuous learning and improvement over time.

1.3 Learning from failure in the clinical workplace

The literature on learning from failure offers powerful arguments for the important role of failure for learning in classroom settings and nonclinical workplaces such as human resource development and organizational learning. What has not yet been explored is the role of learning from failure in the clinical workplace. Supervisors can create an environment that supports *productive failure* and promotes deep learning by encouraging trainees to take risks, make mistakes, and learn from them. However, clinical learning environments have very different stakes than classrooms or business environments. Stakes often refer to the potential consequences, risks, or importance attached to the outcomes of a situation, or the decisions made by its characters.[45,46] High stakes tend to raise the tension and increase the sense of risk and potential consequences. In clinical settings, the consequences can feel higher than other disciplines, considering life and death. The portrayal of these stakes can evoke emotions and empathy, shed light on the challenges faced by healthcare professionals, and explore the moral dilemmas they encounter. The nature of the stakes could play a crucial role in allowing failure as a phenomenon in the clinical setting. Allowing failure in medicine can introduce unpredictability and make it in the clinical setting even more provocative, as the outcomes become uncertain and individuals, particularly patients and trainees, are confronted with the possibility of adverse consequences. However, recognizing the stakes and understanding their implications allow for a deeper engagement with this phenomenon and a greater appreciation of the challenges and consequences individuals face in health care.

In healthcare, various factors can hinder or foster the effective usage of failure as a learning opportunity, both, influenced by the cultural and educational context. The culture of perfectionism prevalent in healthcare education can create

unrealistic expectations and pressure on trainees to avoid failure at all costs.[47] This mindset may discourage risk-taking and experimentation, limiting opportunities for innovative thinking and skill development. In a culture where mistakes are stigmatized and viewed as unacceptable, an environment is created where trainees and educators may find it challenging to embrace the concept of productive failure.[47,48] Failure is commonly associated with strong emotions because it challenges one's own and potential other expectations, goals, and self-perception. When we fail to achieve something, we set out to accomplish, it often triggers a range of intense, negative emotions such as frustration, disappointment, anger, sadness, or even shame.[6] Several factors may contribute to the strong emotional response associated with failure and may support, or when too intense, hinder learning. Failure in healthcare – whether it is failure in clinical reasoning or decision-making, failure during a technical procedure, or failure to communicate effectively – may come with perceived consequences. These consequences can include missed opportunities, setbacks in personal or professional growth, and, in the worst-case scenario, damage to patients.

Receiving a shame-and-blame response to failure can further exacerbate the negative emotional impact. When failure is met with criticism and punitive measures, trainees may become more reluctant to admit their mistakes or seek help, hindering their ability to learn from the experience and impeding their professional development.[49,50] The fear of failure and the associated shame-and-blame response further compound the socio-emotional impact of failure.[6,51] These negative emotions can impede learners' willingness to take risks, experiment with new approaches, and fully engage in the learning process. Moreover, the inherent desire for infallibility in healthcare can pose a significant obstacle to learning from failure.[52,53] Trainees may resist engaging in workplace-based failure training strategies due to concerns about the potential negative consequences for their professional reputation or patient safety.[48,54]

Given our focus on allowed failure as a pedagogy, the supervisor's role is integral. Clinical supervisors face the critical task of balancing patient care with clinical training, a challenge that requires skillful navigation and effective time management. Doing so, they integrate teaching moments into everyday patient encounters and may pause during patient interactions to provide brief explanations, clarify concepts, or discuss evidence-based approaches. By seizing these teachable moments, supervisors maximize the learning potential within patient care, making it a seamless, integrated process while working actively to ensure that the training process contributes positively (and not negatively) to safe patient care. To accomplish this challenge, they have to employ various

strategies and approaches to ensure that both patients' needs and the professional development of trainees are addressed adequately.

Clinical supervision has been characterized as including clinical management, teaching and research, management and administration, pastoral care, interpersonal skills, personal development and reflection.[17] Effective clinical supervisors must have good interpersonal skills and teaching skills, and be clinically competent and knowledgeable. And they need to encourage independent decision-making by supervisees. As trainees gain experience and proficiency, supervisors gradually delegate more responsibility, allowing them to actively participate in patient care while maintaining a supportive learning environment and intervening if necessary to mitigate any risks to patient well-being. This empowerment fosters trainees' professional growth and instills a sense of ownership and accountability in their clinical practice. One of many approaches to foster this gradually autonomy of trainees might be allowing failure as a supervisory strategy. However, allowing failure has not yet been described in the literature on clinical supervision. This may be related to the sensitivity of the topic.

1.4 Sensitivity of the research topic

While allowing failure in domains outside healthcare is sometimes embraced as innovative and a source for learning and improvement, such an approach might be seen differently in healthcare. Due to the high stakes involved, legal implications, ethical consideration, emotional impact, and the need to maintain public trust, allowing failure in the clinical situation is a sensitive topic. Below I briefly reflect on the sensitivity of my research topic and the language associated with it because it influenced my research questions, study designs and sampling procedures, and decisions about where and how to disseminate the findings.

Several reasons contribute to the potential sensitivity, which I had to consider while developing this research program and exploring this phenomenon in depth. First, the primary concern in healthcare is patient safety. Any type of failure in this context can have serious consequences for the well-being and lives of patients. This sensitivity arises from the moral and ethical responsibility to provide the best possible care, and failure can result in harm or, in the worst-case scenario the loss of life. Second, failures in healthcare can lead to legal and liability concerns and medical malpractice claims, and lawsuits can have significant financial implications for healthcare professionals and organizations. Therefore, the sensitivity around failure is heightened due to the potential legal

repercussions and the need to mitigate risk. Hand in hand with the legal and liability concerns, failure can damage the professional reputation, including the professional standing, credibility, and patient trust of an individual physician or even a whole institution. Here, the sensitive nature of failure stems from the fear of tarnishing one's reputation and the potential impact on future career prospects, while healthcare professionals strive to maintain a positive reputation and trust within their communities. Fourth, failure in healthcare can have a profound emotional impact on healthcare professionals. Medical professionals have a strong sense of duty and commitment to their patients' care and well-being. They may experience guilt, shame, and emotional distress when failures occur. In this context, the term "the second victim" arose in the literature on medical error, describing the emotional impact of medical errors on physicians.[10,55] Sensitively addressing failure becomes crucial to supporting the well-being and resilience of healthcare providers. The sensitivity around failure in healthcare is heightened by the need to maintain public confidence and ensure transparency in addressing and learning from mistakes. Another reason for the sensitivity of the phenomenon explored arises from the resistance to change and the potential discomfort associated with challenging established norms. Historically, many healthcare organizations have a culture focusing on individual blame and punishment rather than promoting a learning environment. Shifting this culture to embrace failure as an opportunity for improvement requires significant cultural transformation. Last, failures in healthcare can receive substantial attention from the media and the public. Negative publicity can impact public trust in healthcare systems and contribute to a climate of skepticism and fear. Balancing the need for accountability and patient safety with a supportive and learning-oriented approach requires careful navigation and sensitivity to the complex dynamics at play.

Even the term "failure' itself is a sensitive one, which present challenges for the undertaking of this work. It is related are the other key terms used in the discourse of patient safety, such as mistake, error, mishap, failure, and adverse event – terms with negative connotations. While often used without definition and in combination, these terms are not synonymous. In general, the words "mistake" and "error," both are compound words referring to an unwitting or unintentional action. A "mistake," as the word is used in daily conversation, is something small and forgivable, an unintended accident with no or only minor consequences;[56] a real synonym might be "mishap."[57] The Institute of Medicine defined error as "the failure of a planned action to be completed as intended or the use of a wrong plan to achieve an aim."[3] An adverse event is an injury resulting from a medical intervention, or in other words, it is not due to the

underlying condition of the patient.[3] In the daily business of the clinical environment, all these terms might be often used synonymously and incorporate the meaning and idea of failure. Therefore, to use "failure" with positive learning connotations in this broader patient safety discourse is tricky. Readers (and audiences) are influenced by the negative assumptions they bring to this cluster of terms, and they may struggle to shift these assumptions to acknowledge the potential positive influences of failure for learning. Throughout this work, we continually grappled with the meanings and sensitivities that participants and audiences brought to our key term.

1.5 Research Questions and Approach

With this thesis, I aim to investigate allowing failure as an educational strategy in clinical supervision during residency training. The research questions are as follows:

1. What is the existing body of literature in medical education regarding the practice of allowing failure during clinical supervision, and what are its key findings, gaps, and implications for future research and practice? (Chapter 2)
2. When, how and why do clinical educators purposely allow failure as an educational strategy? (Chapters 3, 4 and 5)
3. How do residents experience allowed failure? (Chapter 6)

1.6 Thesis outline

Chapter 2 provides a literature review to explore the postgraduate medical education and higher education literature for existing knowledge and gaps regarding the educational phenomenon of allowing failure. This chapter addresses the first research question and informs the later developed research of this thesis by presenting the related literature on resident errors in medicine and their implications for patients' safety and trainee learning. In addition, it provides an overview of how failure is conceptualized in the literature of other research fields, its implications for their field, and what it might imply for the clinical setting.

Chapter 3 explores the second research question; clinical supervisors' perceptions of allowing failure in clinical training during clinical encounters. This qualitative study aims to understand if clinical supervisors confirm that they allow trainees

to fail for educational purposes. It further seeks to investigate how such a situation may look in order to define the phenomenon of allowing failure from supervisors' narratives.

Chapter 4 continues the line of inquiry into the experiences of clinical supervisors from different clinical settings and institutions by elaborating on how they decide to allow trainees to fail.

Chapter 5 intends to illuminate how context and institutional design might influence the supervisory decision to allow failure in medicine. Therefore, this qualitative study inquiries about the phenomenon of allowing failure to understand how clinical supervisors would use this strategy in one specific context as a single-centre exploration. All those chapters (3, 4, and 5) address the second research question.

Chapter 6, addressing the third research question, shifts the interest towards trainees and explores how they experience allowed failure in clinical training. This study investigates trainees' awareness and experience of failure in clinical settings, focusing on the emotional and educational value of failure.

Chapter 7 summarizes my gained understanding of complex work-based training phenomena, such as allowing failure, while highlighting the interactions among clinicians, trainees and patients as non-linear. Drawing on the non-linearity, this commentary focuses on the literature called "it depends" research to demonstrate that by empirical research identified factors and a variety of unknown influential variables such as subconscious factors within the trustor, mood, and gut feeling combined results in non-linear phenomena.

Chapter 8 integrates the lessons from the different studies, highlighting the main findings and implications for research and practice. I also acknowledge the main challenges emerging from this topic, discuss the potential impact of this thesis, and summarize the overall work.

1.6.1 Methodological considerations

All presented studies in this research program were informed by a constructivist epistemology because the phenomenon being explored is a social process based in interactions, and it is not yet explained by pre-existing theory.[58] I chose constructivist grounded theory also as it allowed to capture nuances and patterns of behaviour in the field, which are essential for understanding the research questions.[59] Its inductive, iterative, and discovery-oriented approach

allowed for the development of a theory from the data, collected in the field.[60] Additionally, the method provided the opportunity for data to be collected and analyzed from multiple perspectives, which supports a deeper understanding of a complex phenomenon.[59,60] Expecting that an individual interview method maximizes the likelihood that participants feel comfortable in speaking candidly and strengthens the anonymity and confidentiality of those responses, especially being interviewed from an insider,[61] I selected individual interviews rather than focus groups. For the interviews, I used use a semi-structured interview format to explore how participants approach failure as an educational strategy.[60] Further, using constructivist grounded theory provided the opportunity to intentionally build upon insights across a series of sequential studies.[62] Consequently, the developed research questions of the trainee study and also the presented clinical vignettes in later studies were informed by previous research.

1.6.2 Reflexivity

Drawing from my multifaceted professional and personal experiences, with this reflexivity I intent to delve into the intricate interplay between failure, my professional development, and personal growth, within the realm of surgical practice, thereby contributing to a deeper understanding of the subject matter. As a surgical trainee, I encountered numerous challenges and setbacks, inevitably encountering failure at various stages of my training. These experiences have not only tested my resilience but have also provided invaluable insights into the complex dynamics surrounding failure in my field. Transitioning into the role of a more experienced surgeon, my encounters with failure took on new dimensions, as I had to navigate the pressures and responsibilities associated with patient care, trainee learning and my own responsibilities. Additionally, assuming my role of a surgical supervisor provided me with a unique vantage point to observe and guide others through their own encounters with failure. Later, I aim to highlight my experiences living in two paradigms as a surgeon and a qualitative research-oriented scientist and how that shaped this work.

Being a surgeon, I learned to reflect deeply upon my actions and decisions and be honest with myself about whether my actions and decisions have been successful. This can be difficult, however, especially while struggling to accept my own fallibility and in trying to live up to the expectation of perfectionism, fighting with my inner imposter. Also, the shame and blame culture in our field, associated with failure, enforced that I grapple with failure instead of seeing it as a chance to learn and grow.

Throughout my career, I learned that failure is a powerful teacher, but also a double-edged sword as the learning comes with a price. At the end of medical school, I knew very little about what failing meant in the clinical environment. As a surgical trainee, I failed more than I could ever imagine before entering residency, and the consequences of failure in the clinical environment were different. Failure in my line of work indirectly or directly impact patient safety and care. Failure to perform a task can result in medical errors and even patient death, which I could barely dwell on. However, by being open to failure, I can remain humble as a surgeon and be aware of my own limitations and strive to constantly improve my technique.

Later in my career, my relationship to failure shifted and even introduced me to this line of research. I supervised in my role as a surgical educator one of my fifth-year residents during a laparoscopic cholecystectomy, which is a minimal-invasive operation on the gallbladder. She was experienced in minimal-invasive procedures, and I had supervised her a lot. She had been confident during the last few operations we performed together and had operated without any complications. This particular gallbladder was easy to resect, so I stepped back and let her operate. For surgeons, it may seem like a simple procedure, for most surgeons at least it is, but you need to pull on the gallbladder just enough that you balance tension and the exposure of the tissue. I warned her in this case in advance and told her to be careful because the capsule of such a fatty liver is vulnerable. At one point in this latest intervention, she grasped the gallbladder and put too much tension on the patient's fat liver, and I could see that the capsule of the liver would be damaged and bleed. This time, however, in just a second, I decided to not repeat myself. I let her fail. I was deeply confident that she would manage the situation and stop the minor bleeding and the patient wouldn't at any time be at serious risk. And what I expected happened: the capsule of the liver damaged and started to bleed slightly. The resident was irritated in her standardized procedure but handled the situation very well. After the operation, we talked about what to do next: it is important to me that surgeons assume responsibility for their actions disclosing such events to the patient, and she did so. At first, the resident felt stupid and guilty, and then she was anxious about the rehabilitation of our patient, who could develop complications because of her error. The patient left the hospital after 2 days like any patient after a laparoscopic cholecystectomy with full rehab.

One might ask, why did I decide to let her fail or when did I decide to let her fail this time?

How could I even do this? Was it a calculated risk? How could I know that she or we would fix the problem without further harming the patient? How will this experience of failure guide her future performance? What is the potential of teaching and learning through such a situation? I asked myself such questions repeatedly, struggling with the ethical responsibility as a physician and accountability as a surgeon towards the patient. The resident confirmed, however, some weeks after the described event, she had learned three lessons from this error event, and she was able to articulate them in detail: (1) What looks like a fatty liver behaves like a fatty liver; (2) There is that saying: "Tension is the surgeons friend" but not only tension is important, good exposure of the tissue is key; and (3) Not every error produces a complication- which is good news for us. I was impressed how she was able to remember what she had learned and also intrigued how she coped with the situation. To me, it seemed potentially problematic but also very powerful.

Until today, I deeply hate any kind of complications, as I described in a recent essay, called "It Hurts Whether You Fail or Not" as a "teaching and learning moment."[63] However, thanks to my research program, I feel more at ease with failure and being perfectly imperfectly as a human being and a surgeon and try to see failure as an opportunity for learning and growth. As a surgeon with a complex yet, from my standpoint, intriguing relationship to failure, it was essential to reflect on the assumptions I brought to each part of the research process.

I also have to acknowledge that my perspective on examples from clinical supervisors shifted over time as my personal and professional situation changed as the research program progressed. I would reflect that my role as a mom of a two-year-old daughter, I struggled to remain impartial and objective in analyzing the data in the pediatric setting. I felt a personal stake in the outcome, realizing that pediatric attendings allow failure. Furthermore, in the resident study, I sometimes had to work to remain focused on the analysis and not become overwhelmed by the intense emotions of the interviewed residents getting flashbacks on my residency. I had to confront my own feelings of responsibility and guilt that stemmed from the failures I had encountered in the past. It was challenging to accept my shortcomings in the face of failure. For instance, experiencing motherhood for the first time changed my mind about the account of an obstetrician who allowed failure during a C-section, potentially endangering the mother and the baby. I presented this same example before I was a mother during a medical education conference and could understand but not feel the strong reactions to it. Being a mother now, I am able to relate to it and

feel those reactions from shocked audiences. Having experienced such strong responses from an audience, I started to get cautious about the chosen accounts for a presentation. However, even selecting another, less potentially harmful account from a supervisor of an ED prompted one of the congress participants to approach me after the presentation to tell me that her mother was just admitted to the hospital under the same circumstances as I presented in the supervisor's account. I had to accept that I would receive such responses, whatever examples I could tell an audience from my research program.

After collecting my first research experiences in surgery, I was involved in quantitative and numbers-driven research. Discovering qualitative research was an eye-opening beginning of my journey as a clinical and educational researcher. Over the past few years, I have developed and grown as a qualitative researcher, especially since my reflexivity appears more nuanced and sophisticated than before. I feel more comfortable asking questions during the interviews that might affect the participants, the story they are sharing, or the direction the narratives are taking. I wouldn't have asked questions like "How do you feel about XX" when I first started doing qualitative research, but I would now. However, I also acknowledge that the growth of a qualitative researcher in reflexivity is a continuous process that involves ongoing self-reflection, critical awareness, and a willingness to engage with the complexities and challenges of the research process. Still, I am willing and open-minded to do so to develop my reflexivity to become a powerful tool for producing rigorous, nuanced, and insightful research.

I conducted my early projects with a sense of apprehension, as I wasn't sure how to approach the data or best present my findings. At the beginning, I was less likely to read between the lines to understand the tone or the combined flavor of, say, contradictory examples given side by side in a transcript. Through continued practice and experience, I have gained greater confidence in my ability to conduct qualitative research. For instance, in the supervisory study compared to the later studies on residents' perspectives, where some participants crystallized as discrepant cases. I tended to take participants' words literally and in context. Now, this situation has shifted, and I sometimes have to restrain myself from interpreting during an interview. In general, I feel more comfortable and at ease with my ability to both literally and critically "read" the transcripts, which supported to identify more accurately patterns and draw meaningful conclusions from the data. At the same time, I am more comfortable presenting my findings to audiences. The medical education community was probably the best audience to practice and develop as a qualitative researcher. However, I still

feel as though I have two identities, one as an educational researcher, where qualitative research is appreciated and supported, and one as a clinical researcher, where I still grapple with colleagues or superiors who do not see the justification in doing qualitative research. There, I often experience rejections in different ways: for research submissions, presenting orals at conferences, or for disparaging comments from peers or superiors. My surgical colleagues and supervisors act as positivists, they assume that reality is objective and can be measured and quantified through scientific methods. However, I identify as a constructivist, who argues that reality is socially constructed and that subjective experiences and interpretations shape knowledge. In order to explain my standpoint and research to my surgical tribe, I wish for better skills in the future to effectively communicate the value of my research. A publication in a high-impact surgical, non-educational journal would help with such persuasion.

Last, being an 'insider' in the research environment guarantees certain privileges and breaks down barriers to facilitate smoother communication with colleagues and peers.[61] In this regard, I examined the work of other qualitative researchers, who were mindful of the advantages that having similar backgrounds brings to researchers.[64–68] These advantages include ease and understanding of the setting. My familiarity with the unspoken rules of the clinical environment and the beliefs of the participants of this study, as well as my knowledge as a surgeon and clinical supervisor and a former resident with experiences in surgery, the emergency department (ED) and the intensive care unit (ICU), proved to be invaluable during the research process. My position as a surgeon and colleague enabled fruitful, in-depth conversations and reflections that would not have been possible for a non-insider. However, the same position might have hindered honest reflections from some participants. Even if I didn't realize that feeling during the interviews, I sometimes felt when analyzing the data that some participants may have felt reluctant to express their honest reflections. This could be attributed to a variety of factors, including personal or professional dynamics such as hierarchy or fear of judgement. Therefore, I always tried to create a safe and non-judgmental space where participants felt comfortable expressing their thoughts and opinions and emphasized that the purpose of the interview was to gather diverse perspectives rather than evaluate individuals. Further, I assured anonymity or confidentiality to my colleagues in order to alleviate concerns about potential repercussions or judgement, allowing them to speak more freely and honestly.

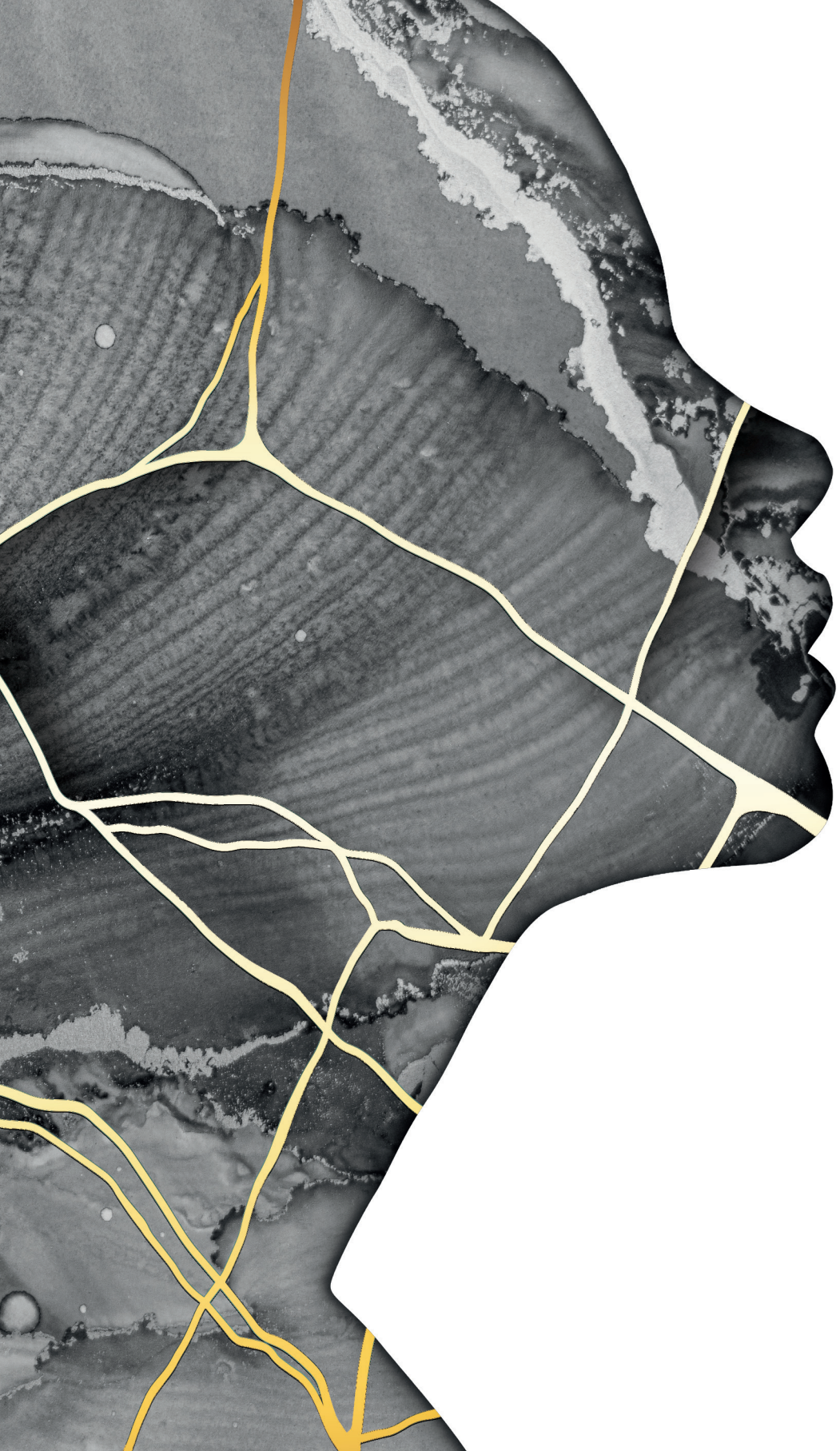
Overall, my development and growth as a qualitative researcher have been an exciting journey of discovery, joy, personal and professional growth but also from setbacks and rejection.

References

1. https://www.merriam-webster.com/dictionary/failure.
2. Shai D, Chen C, Pooley M, D'Andrade BW. 10 - Prognostics for the Power Industry. In: D'Andrade BW, ed. *The Power Grid*. Academic Press; 2017:287-316. doi:10.1016/B978-0-12-805321-8.00010-0
3. Institute of Medicine (US) Committee on Quality of Health Care in America. *To Err Is Human: Building a Safer Health System*. (Kohn LT, Corrigan JM, Donaldson MS, eds.). National Academies Press (US); 2000. Accessed September 4, 2019. http://www.ncbi.nlm.nih.gov/books/NBK225182/
4. Kroll L, Singleton A, Collier J, Rees Jones I. Learning not to take it seriously: junior doctors' accounts of error. *Medical Education*. 2008;42(10):982-990. doi:10.1111/j.1365-2923.2008.03151.x
5. Scott SD, Hirschinger LE, Cox KR, McCoig M, Brandt J, Hall LW. The natural history of recovery for the healthcare provider "second victim" after adverse patient events. *Quality and Safety in Health Care*. 2009;18(5):325-330. doi:10.1136/qshc.2009.032870
6. Bynum WE, Artino AR, Uijtdehaage S, Webb AMB, Varpio L. Sentinel Emotional Events: The Nature, Triggers, and Effects of Shame Experiences in Medical Residents. *Academic Medicine*. 2019;94(1):85-93. doi:10.1097/ACM.0000000000002479
7. Bradley CK, Fischer MA, Walsh KE. Trends in medical error education: Are we failing our residents? *Academic Pediatrics*. 2013;13(1):59-64. doi:10.1016/j.acap.2012.10.004
8. Fischer MA, Mazor KM, Baril J, Alper E, DeMarco D, Pugnaire M. Learning from mistakes: Factors that influence how students and residents learn from medical errors. *Journal of General Internal Medicine*. 2006;21(5):419-423. doi:10.1111/j.1525-1497.2006.00420.x
9. Wu AW, Folkman S, McPhee SJ, Lo B. Do house officers learn from their mistakes? *JAMA*. 1991;265(16):2089-2094.
10. Wu AW. Medical error: the second victim. *BMJ*. 2000;320(7237):726-727. doi:10.1136/bmj.320.7237.726
11. Tamuz M, Giardina TD, Thomas EJ, Menon S, Singh H. Rethinking resident supervision to improve safety: From hierarchical to interprofessional models. *Journal of Hospital Medicine*. 2011;6(8):445-452. doi:10.1002/jhm.919
12. Fallon WF, Wears RL, Tepas JJ. RESIDENT SUPERVISION IN THE OPERATING ROOM: DOES THIS IMPACT ON OUTCOME? *The Journal of Trauma: Injury, Infection, and Critical Care*. 1993;35(4):556-561. doi:10.1097/00005373-199310000-00010
13. Gennis VM, Gennis MA. Supervision in the outpatient clinic: Effects on teaching and patient care. *J Gen Intern Med*. 1993;8(7):378-380. doi:10.1007/BF02600077
14. Institute of Medicine (U.S.), Ulmer C, Wolman DM, Johns MME, eds. *Resident Duty Hours: Enhancing Sleep, Supervision, and Safety*. National Academies Press; 2009.
15. Singh H, Thomas EJ, Petersen LA, Studdert DM. Medical errors involving trainees: a study of closed malpractice claims from 5 insurers. *Arch Intern Med*. 2007;167(19):2030-2036. doi:10.1001/archinte.167.19.2030
16. Kilminster SM, Jolly BC. Effective supervision in clinical practice settings: a literature review. *Med Educ*. 2000;34(10):827-840.
17. Kilminster S, Cottrell D, Grant J, Jolly B. AMEE Guide No. 27: Effective educational and clinical supervision. *Med Teach*. 2007;29(1):2-19. doi:10.1080/01421590701210907
18. Mylopoulos M, Kulasegaram K, Woods NN. Developing the experts we need: Fostering adaptive expertise through education. *Evaluation Clinical Practice*. 2018;24(3):674-677. doi:10.1111/jep.12905
19. Mylopoulos M, Steenhof N, Kaushal A, Woods NN. Twelve tips for designing curricula that support the development of adaptive expertise. *Medical Teacher*. 2018;40(8):850-854. doi:10.1080/0142159X.2018.1484082
20. Wong SSH, Lim SWH. Prevention–Permission–Promotion: A Review of Approaches to Errors in Learning. *Educational Psychologist*. 2019;54(1):1-19. doi:10.1080/00461520.2018.1501693
21. Wong SSH, Lim SWH. The derring effect: Deliberate errors enhance learning. *Journal of Experimental Psychology: General*. 2022;151(1):25-40. doi:10.1037/xge0001072
22. Kapur M. Productive Failure in Learning Math. *Cognitive Science*. 2014;38(5):1008-1022. doi:10.1111/cogs.12107

23. Kennedy TJT, Regehr G, Baker GR, Lingard LA. Progressive independence in clinical training: a tradition worth defending? *Academic medicine : journal of the Association of American Medical Colleges*. 2005;80(10):106-111. doi:10.1097/00001888-200510001-00028
24. Kennedy TJT. Towards a tighter link between supervision and trainee ability. *Medical Education*. 2009;43(12):1126-1128. doi:10.1111/j.1365-2923.2009.03543.x
25. Kapur M. Examining Productive Failure, Productive Success, Unproductive Failure, and Unproductive Success in Learning. *Educational Psychologist*. 2016;51(2):289-299. doi:10.1080/00461520.2016.1155457
26. Woodcock C, Richards H, Mugford A. Quality Counts: Critical Features for Neophyte Professional Development. *Sport Psychologist*. 2008;22(4):491-506.
27. Bjork EL, Bjork RA. Making things hard on yourself, but in a good way: Creating desirable difficulties to enhance learning. In: *Psychology and the Real World: Essays Illustrating Fundamental Contributions to Society*. Worth Publishers; 2011:56-64.
28. Guadagnoli MA, Lee TD. Challenge Point: A Framework for Conceptualizing the Effects of Various Practice Conditions in Motor Learning. *Journal of Motor Behavior*. 2004;36(2):212-224. doi:10.3200/JMBR.36.2.212-224
29. Guadagnoli M, Morin MP, Dubrowski A. The application of the challenge point framework in medical education: Application of the challenge point framework. *Medical Education*. 2012;46(5):447-453. doi:10.1111/j.1365-2923.2011.04210.x
30. Kapur M. Productive Failure. *Cognition and Instruction*. 2008;26(3):379-424. doi:10.1080/07370000802212669
31. Kapur M, Rummel N. Productive failure in learning from generation and invention activities. *Instructional Science*. 2012;40(4):645-650. doi:10.1007/s11251-012-9235-4
32. Sinha T, Kapur M. When Problem Solving Followed by Instruction Works: Evidence for Productive Failure. *Review of Educational Research*. 2021;91(5):761-798. doi:10.3102/00346543211019105
33. Kapur M, Bielaczyc K. Designing for Productive Failure. *Journal of the Learning Sciences*. 2012;21(1):45-83. doi:10.1080/10508406.2011.591717
34. Kapur M. Learning from productive failure. *Learning: Research and Practice*. 2015;1(1):51-65. doi:10.1080/23735082.2015.1002195
35. Steenhof N, Woods NN, Mylopoulos M. Exploring why we learn from productive failure: insights from the cognitive and learning sciences. *Adv in Health Sci Educ*. 2020;25(5):1099-1106. doi:10.1007/s10459-020-10013-y
36. Steenhof N, Woods NN, Van Gerven PWM, Mylopoulos M. Productive failure as an instructional approach to promote future learning. *Adv in Health Sci Educ*. 2019;24(4):739-749. doi:10.1007/s10459-019-09895-4
37. Wong SSH, Lim SWH. Deliberate errors promote meaningful learning. *Journal of Educational Psychology*. 2022;114(8):1817-1831. doi:10.1037/edu0000720
38. Wong SSH. Deliberate Erring Improves Far Transfer of Learning More Than Errorless Elaboration and Spotting and Correcting Others' Errors. *Educ Psychol Rev*. 2023;35(1):16. doi:10.1007/s10648-023-09739-z
39. Cannon MD, Edmondson AC. Failing to Learn and Learning to Fail (Intelligently). *Long Range Planning*. 2005;38(3):299-319. doi:10.1016/j.lrp.2005.04.005
40. Edmondson. Strategies of learning from failure. *Harv Bus Rev*. 2011;89(4):48-55, 137.
41. Edmondson A. Psychological Safety and Learning Behavior in Work Teams. *Administrative Science Quarterly*. 1999;44(2):350-383. doi:10.2307/2666999
42. Edmondson. Learning from failure in health care: frequent opportunities, pervasive barriers. *Quality and Safety in Health Care*. 2004;13(suppl_2):ii3-ii9. doi:10.1136/qshc.2003.009597
43. Chmutina K, Von Meding J. A Dilemma of Language: "Natural Disasters" in Academic Literature. *Int J Disaster Risk Sci*. 2019;10(3):283-292. doi:10.1007/s13753-019-00232-2
44. Rodziewicz TL, Houseman B, Hipskind JE. Medical Error Reduction and Prevention. In: *StatPearls*. StatPearls Publishing; 2023. Accessed October 7, 2023. http://www.ncbi.nlm.nih.gov/books/NBK499956/
45. Loewenstein GF, Weber EU, Hsee CK, Welch N. Risk as feelings. *Psychological Bulletin*. 2001;127(2):267-286. doi:10.1037/0033-2909.127.2.267

46. Kinnear B, Warm EJ, Caretta-Weyer H, et al. Entrustment Unpacked: Aligning Purposes, Stakes, and Processes to Enhance Learner Assessment. *Academic Medicine*. 2021;96(7S):S56-S63. doi:10.1097/ACM.0000000000004108
47. Thomas M, Bigatti S. Perfectionism, impostor phenomenon, and mental health in medicine: a literature review. *Int J Med Educ*. 2020;11:201-213. doi:10.5116/ijme.5f54.c8f8
48. Walton M, Harrison R, Burgess A, Foster K. Workplace training for senior trainees: a systematic review and narrative synthesis of current approaches to promote patient safety. *Postgrad Med J*. 2015;91(1080):579-587. doi:10.1136/postgradmedj-2014-133130
49. Gingerich A, Sebok-Syer SS, Lingard L, Watling CJ. The shift from disbelieving underperformance to recognising failure: A tipping point model. *Medical Education*. 2022;56(4):395-406. doi:10.1111/medu.14681
50. Ajjawi R, Bearman M, Molloy E, Noble C. The role of feedback in supporting trainees who underperform in clinical environments. *Front Med*. 2023;10:1121602. doi:10.3389/fmed.2023.1121602
51. Bynum WE, Goodie JL. Shame, guilt, and the medical learner: ignored connections and why we should care. *Med Educ*. 2014;48(11):1045-1054. doi:10.1111/medu.12521
52. Craiovan PM. Correlations between Perfectionism, Stress, Psychopathological Symptoms and Burnout in the Medical Field. *Procedia - Social and Behavioral Sciences*. 2014;127:529-533. doi:10.1016/j.sbspro.2014.03.304
53. Peters M, King J. Perfectionism in doctors. *BMJ*. 2012;344(mar16 3):e1674-e1674. doi:10.1136/bmj.e1674
54. Ross PT, McMyler ET, Anderson SG, et al. Trainees' perceptions of patient safety practices: recounting failures of supervision. *Jt Comm J Qual Patient Saf*. 2011;37(2):88-95.
55. Wu AW. Medical error: the second victim. The doctor who makes the mistake needs help too. *BMJ*. 2000;320(7237):726-727.
56. https://www.merriam-webster.com/dictionary/mistake.
57. https://www.merriam-webster.com/dictionary/mishap.
58. Charmaz K. *Constructing Grounded Theory: A Practical Guide through Qualitative Analysis*. Repr. Sage; 2012.
59. Kennedy TJT, Lingard LA. Making sense of grounded theory in medical education. *Med Educ*. 2006;40(2):101-108. doi:10.1111/j.1365-2929.2005.02378.x
60. Watling CJ, Lingard L. Grounded theory in medical education research: AMEE Guide No. 70. *Medical Teacher*. 2012;34(10):850-861. doi:10.3109/0142159X.2012.704439
61. Dwyer SC, Buckle JL. The Space Between: On Being an Insider-Outsider in Qualitative Research. *International Journal of Qualitative Methods*. 2009;8(1):54-63. doi:10.1177/160940690900800105
62. Charmaz K. *Constructing Grounded Theory*. Sage Publications; 2006.
63. Klasen JM. It Hurts Whether You Fail or Not. *Academic Medicine*. 2020;95(8):1207-1207. doi:10.1097/ACM.0000000000003467
64. Moulton CA, Regehr G, Lingard L, Merritt C, MacRae H. Operating from the Other Side of the Table: Control Dynamics and the Surgeon Educator. *Journal of the American College of Surgeons*. 2010;210(1):79-86. doi:10.1016/j.jamcollsurg.2009.09.043
65. Moulton C anne E, Regehr G, Mylopoulos M, MacRae HM. Slowing Down When You Should: A New Model of Expert Judgment: *Academic Medicine*. 2007;82(Suppl):S109-S116. doi:10.1097/ACM.0b013e3181405a76
66. Taylor TS, Watling CJ, Teunissen PW, Dornan T, Lingard L. Principles of fatigue in residency education: a qualitative study. *CMAJ Open*. 2016;4(2):E200-E204. doi:10.9778/cmajo.20150086
67. Taylor TS, Teunissen PW, Dornan T, Lingard L. Fatigue in Residency Education: Understanding the Influence of Work Hours Regulations in Europe. *Academic Medicine*. 2017;92(12):1733-1739. doi:10.1097/ACM.0000000000001831
68. Taylor TS, Nisker J, Lingard L. To Stay or Not to Stay? A Grounded Theory Study of Residents' Postcall Behaviors and Their Rationalizations for Those Behaviors: *Academic Medicine*. 2013;88(10):1529-1533. doi:10.1097/ACM.0b013e3182a31157



2

Allowing failure for educational purposes in postgraduate clinical training: A narrative review

Published as
Klasen JM, Lingard LA.
Allowing failure for educational purposes in postgraduate clinical training: A narrative review.
Med Teach. 2019 Nov;41(11):1263-1269.

Abstract

Background
Educational domains such as pedagogy or psychology have embraced the philosophy that "allowing failure" in training and practice is essential to learn. In clinical training, however, allowing learners to fail is not explicitly discussed as a strategy, possibly due to the negative implications for patients. Therefore, we do not know whether clinical supervisors allow trainees to fail for educational purposes and, if so, how this supervisory strategy is used.

Methods
To inform research on this topic, we conducted a narrative review to understand what was known about this educational strategy in postgraduate medicine.

Results
Analyzing the selected literature, we found no studies directly exploring the question of clinical supervisors allowing failure as an educational strategy. However, related literature on resident errors suggested that trainees perceived their own errors to be highly instructive and that factors such as a sense of responsibility and emotional response influenced the educational impact of these errors.

Conclusions
The lack of discussion in the medical education literature regarding allowing failure for learning suggests that we need research into the nature and extent of this supervisory strategy which may hold educational benefits but must be employed in a manner that upholds patient safety and safeguards trainee resilience.

Introduction

Failure can be a powerful teacher. As Robert F. Kennedy said of leadership, "Only those who dare to fail greatly can ever achieve greatly."[1] As the British author and educationalist Sir Ken Robinson stated in his TED talk, "If you're not prepared to be wrong, you'll never come up with anything original."[2] In medical education, however, the value of failure has received limited attention, perhaps because it is in tension with the value of patient safety. A recent publication on clinical supervision foregrounded this tension,[3] emphasizing supervisors' joint roles to both support the developing practitioner and protect the health system. How exactly this tension is navigated remains one of the underexplored aspects of workplace supervision.[4]

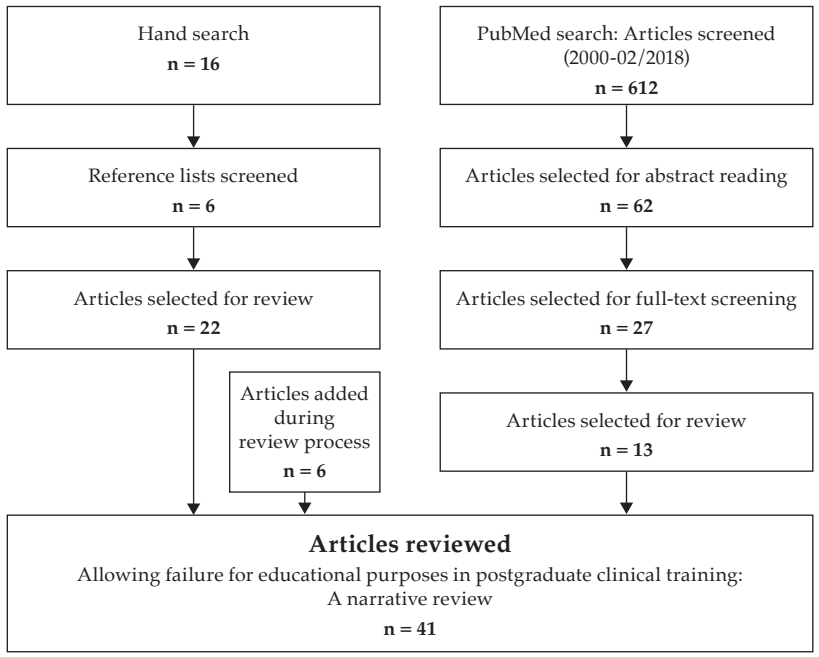
Clinical training is strongly predicated on the notion that learners will engage in activities at the edge of their clinical competence, in order to develop necessary skills for future independent practice.[5] Working at this edge, they will inevitably experience failure. If effective clinical supervision functions as it is intended and described by Martin et al.,[6] such failure will occur much of the time under the supervision of an expert clinician. Which begs the question, what is the clinical supervisor's role in relation to failure for learning purposes? In informal discussions with clinical colleagues, the authors have heard that clinical supervisors may use failure strategically to help trainees learn. That is, they may allow trainees to fail under supervision in certain clinical situations because they believe that the learning that emerges from such failures is important and necessary, that the risk to the patient is nil or minimal, and that failing under supervision will help equip trainees, clinically and emotion- ally, for when they fail alone later in their careers. We contend that there is an important research program here, exploring if, when, why and how clinical supervisors might allow failure for learning. To inform such empirical research, we explored the postgraduate medical education literature for existing knowledge and gaps regarding this educational phenomenon.

Methods

We conducted a narrative review to ascertain what has been accomplished by previous work and where gaps remain to be filled in our understanding of allowing failure as an educational approach in postgraduate training. Narrative review methodology was appropriate to the resources, context and purpose of this work, an unfunded project to explore existing knowledge on a focused and

relatively new topic.[7] In an initial, non-comprehensive scan of the literature, we conducted a hand search for articles on "allowing failure" and "learning from failure" both in postgraduate medical education and in other educational research fields. Following this, we con- ducted a more focused search of the Pubmed database for articles from 2000 to February 2018 with "medical errors" or "errors" or "failure" or "mistake," "residency" and "internship," "patient safety," "clinical supervision," "teach" and "feedback" in the MeSH terms and/or the title/abstract. This focused strategy was supported by a research librarian from the University of Zurich, Switzerland. We identified additional references by exploring the reference lists of selected papers. In regular authors discussions, we developed topic-related categories to reflect the main insights of the chosen papers and built relationships among these categories. Supported by concept maps and synopses, synthesizing the literature of multiple fields like post-graduate medical education, education science and childhood education, business administration, or sports psychology, we made sense of how the findings related to each other and, overall, how they informed our research topic. Figure 1 outlines our search and selection processes.

Figure 1: Search strategy for review process.



Results

We identified 41 articles for full review analysis. None of these directly addressed the phenomenon of clinical supervisors allowing residents to fail for educational purposes. However, we recognized four related areas of knowledge in the literature of relevance to this phenomenon. These were: (1) the educational value of failure in residency, (2) the educational value of failure in clinical practice, (3) the educational value of failure in other educational settings, and (4) the implications of patient safety culture (PSC) for learning from failure in residency.

The reviewed articles employed a combination of terms, including error, failure, mistake, and mishap. In this paper, rather than selecting a single term and applying it across all articles, we have opted to use the terms employed by the authors when we discuss a particular article. We recognize that these terms are not interchangeable, and that such variety poses a challenge for consistent knowledge building around this topic. However, until the nuanced distinctions among these terms are carefully considered, we consider it problematic to simply merge them into a new vocabulary. In future, a consistent terminology should be decided upon.

Educational value of failure in residency

A number of articles characterized the errors that residents make during their clinical activities, and offered insights into the incidences, types, and causes of resident error, the impacts of resident error, and approaches to teaching around error.

Resident errors

Trainees are known to be a source of mistakes, mainly during hand-offs, in teamwork, and through lack of competence, and their errors are more often complex than those of non-trainees.[8] An extensive review of the files from various insurers in the USA identified 889 cases involving both error and injury; trainees had at least a moderately important role in 27% of these incidents.[8] Further insight into the types of errors trainees make is provided by Wu et al.'s survey of 114 house officers, which showed that common among trainee mistakes were errors of diagnosis (33%), evaluation, and treatment (21%), errors in prescription and dosing (29%), procedural errors (11%), and faulty communication (5%).[9] Likewise, in the single-center analysis by Walling and Veremakis, who studied the patterns of ordering errors by reviewing the charts of patients cared for by first-year residents, 75% of the errors identified related to the choice, dosage, route, frequency, or duration of medications.[10] Similarly, a retrospective

survey of 821 residents and fellows in 76 accredited programs at the Massachusetts General Hospital and Brigham and Women's Hospital in Boston found procedural complications (31%), adverse drug reactions (21%), and infections (11%) as the most commonly occurring adverse events (AEs); overall, 24% of the AE arose from a mistake.[11] Multiple causative factors for resident errors are described in the literature. Primary among these is inexperience, with most cases of medical error occurring in the first year of residency (53%), which were primarily attributable to inattention (45.8%) or deficits in clinical knowledge (43.8%), followed by the second year of residency (36%) and decreases with experience.[9,10,12] In addition, job overload, faulty judgment in complex cases, and excessive hesitation were mentioned as causes of house officers' mistakes in Wu et al.'s study, in which the survey respondents perceived more than one cause leading to an error.[9] In particular, residents and house officers' job overload, including fatigue and an excessively long "to do" list, was identified by multiple studies as a key factor.[11,13] Job overload was also emphasized by Jagsi et al., whose study of causes of mistakes identified by residents as leading to AE included excessive hours of work and other workload issues such as cross-covering too many patients, being responsible for too many patients, inadequate supervision, and problems during hand-offs.[11] Two additional causes of resident error identified across the literature were teamwork issues and technical incompetence involving diagnostic decision making and monitoring of the patient or situation; these factors were significantly more prevalent among trainee cases of error than non-trainee cases.[8,11,13]

Impacts of resident errors

A number of factors shape whether and what a resident learns from failure. Awareness of the failure and a sense of personal investment have both been identified as critical.[14,15] In Fischer et al.'s study of how residents learn from medical errors during clinical training, telephone-interviewed residents perceived that they learned more from actual errors than from near misses.[14] Similarly, in Bradley et al.' telephone survey of pediatric chief residents 96% of those interviewed reported "always" or "often" learning from a medical error they had made during their residency, while 74% stated they had "never" or "rarely" learned from a medical error made by an attending physician and 50% reported "never" or "rarely" learning from a medical error made by a fellow resident.[15] Fischer et al. also described factors influencing learning such as the personality of the attending physician, hospital, or program; the hidden curriculum of the unit, program or hospital; the characteristics of the event itself; the resident's understanding of their role; and the professional or legal consequences.[14]

As residents work through the implications of their own errors, they experience cognitive, behavioral, and emotional reactions. These reactions involve a complex process of recognizing, acknowledging, and taking responsibility for an error, including disclosure and reflection, as well as learning from the error.[14,16] Trainees may also experience very strong emotional responses to error events, which can create short- and long-term distress.[14,16] For instance, participants in Wu et al.'s study reported a variety of strong bad feelings associated with their "significant mistake," including remorse (81%), anger at themselves (79%), guilt (72%), and inadequacy (60%), with emotional distress rated at 71.3 (SD 23.7) on a scale from 0 to 100.[9] Similarly, in Engel et al.'s semi-structured interviews with residents from different specialties, more than half of participants reported negative personal consequences of errors, principally characterized as emotions: they felt "terrible," "upset," "bad," or "devastated."[17] Distress and self- doubt were also articulated by preceptors participating in Mazor's focus groups: preceptors shared that their residents expressed strong emotional reactions like "ready to throw in the towel" or "ready to quit and in hysterics" over a period of 3 weeks after an error.[16]

Taking responsibility has also been reported as important for learning from error. Mazor, Fischer, Haley, Hatem, and Quirk characterized a sense of responsibility as a "prerequisite" for learning from an error.[16] With regard to the negative consequences of their failure, most residents in Fischer et al.'s study perceived that learning from failure goes along with taking responsibility, making statements such as: "… You would still learn but it wouldn't be as complete learning as knowing about an error that has happened and what exactly the consequences were."[14] Moreover, Bradley et al.'s survey of pediatric chief residents found that they perceived they learned more when they had committed the error than when they had witnessed someone else's error, reinforcing the sense that responsibility is necessary for learning.[15] Although taking responsibility has the positive effect of supporting learning, it also has other, more troubling effects that must be recognized. Engel et al.'s interview study of 26 resident physicians suggested that greater perceived personal responsibility for an error, particularly with poorer patient outcomes, was associated with intense personal anguish, which could limit learning unless residents who have made mistakes are provided with reassurance and coping support.[17] Similarly, Wu et al.'s survey of 114 house officers reflecting on a significant mistake found that, while learning was more likely when residents accepted responsibility for their error, acceptance of responsibility was correlated with significant distress.[9] Coping strategies in response to this distress included paying more attention to detail (82%), confirming clinical data

personally (72%), and seeking advice (62%) in the wake of error events.[9] Talking to peers or other healthcare providers was identified as the most common coping strategy while participation in sports, other physical activities, and further kinds of distraction were identified as potentially helpful.[17]

Teaching about error

The possibilities to use medical error as a teaching opportunity are divided into formal and informal.[14,15,18–20] Formal teaching using specific techniques is used to learn about and from medical error: grand rounds, core lectures, small groups, simulations, short courses, interdisciplinary rounds such as morbidity and mortality conferences.[14] However, in their systematic review, Wong et al. argued that although both quality improvement and patient safety curricula significantly increased the acquisition of knowledge regarding care processes, they did not improve the learners' behavior.[20] By contrast, informal discussion in the course of daily clinical interactions like clinical rounds or pharmacy reviews of orders has been identified as a common and effective method of learning from error.[21,22] However, Mazor's focus groups of primary care preceptors outlined barriers to informal teaching around errors, including lack of supervisor training; lack of time, privacy, or institutional support; delay between commission and discovery of the error; and concerns about both the learner's response and the preceptor/learner relationship.[16]

The clinical supervisor is arguably the key to informal teaching around trainee errors. Farnan et al. found that adequate clinical supervision has been associated with improvement of patient- and education-related outcomes.[23] Clinical supervision is a central method for promoting learning in postgraduate medical training, while Walton et al.'s systematic review of workplace training for senior trainees contends that it is also the most overlooked factor.[24] Similarly, a retrospective analysis of workshops addressing patient safety and supervision concluded that improved supervision and communication within the medical hierarchy will not only create more productive learning environments but also improve patient safety by addressing behaviors that would otherwise remain undetected or uncorrected.[25] However, clinical supervision is a complex practice. Coping with the complexity and the expertise of clinical teaching while mastering a broad variety of domains and transforming them for instructional purposes is challenging for clinical teachers in medicine[26] or surgery,[27] but necessary if trainees are to benefit from a safe environment that allows them to learn constructively from their mistakes under clinical supervision. Supervisors' responses to trainees' errors, both corrective and supportive, influence learning, but these responses are variable, shaped by the magnitude of the error, the severity of the clinical outcome, the prior behavior or performance of the learner, the training level of the learner, the timing of discovery relative to commission of the error, the connection between the supervisor and learner, and the learner's response.[16] The fact that clinical teachers share responsibility with their residents for errors committed can also impact the learning that is possible in the supervisory relationship.[16]

Importantly, today's trainees have several supervisors with different responsibilities, and the supervisory relationship may not always be strong. A number of authors warn that situational learning or role modeling are insufficient replacements for strong supervisory interactions; rather, explicit discussion with superiors and specific, constructive feedback are reported to be necessary for learning from error.[9,14,16,28–31] As Walton and Barraclough argue, clinical supervisors need to demonstrate their patient safety knowledge and skills and pass these on with the same dedication as other aspects of their discipline.[32]

Learning from failure in clinical practice

There is extensive literature about clinical errors by practicing physicians, in contrast to the relatively small number of papers, we identified about clinical errors by residents. While we did not exhaustively review this broader literature, we summarize in this section two selected issues strongly relevant to our review question: practicing physicians' emotional responses to and their coping strategies after an error. These factors may influence how clinical supervisors respond to resident errors under their supervision as mentioned by Mazor, Fischer, Haley, Hatem, Quirk in teaching situations of residency.[16] Scott et al. reported the pervasiveness of errors by health professionals: "Regardless of sex, professional background or years of experience, all participants (in our study) easily recalled the immediate and ongoing impact of their specific career jolting event."[33] Overall, the intensity of the experience is influenced by the relationship between the patient and caregiver or past experiences. The recovery process is divided in six stages: (1) chaos and random response, (2) intrusive reflection, (3) restoration of personal integrity, (4) enduring the inquisition, (5) obtaining emotional first aid, and (6) moving on.[33] Health care providers are traumatized by such unanticipated adverse patient events, medical error and/or a patient-related injury error events that they feel frequently so personally responsible for the patient's outcome resulting as a "second victim".[34] Extreme feelings with implications for professional and personal life, such as those experienced by Wu's and Scott et al. "second victims" of errors or AEs, require coping strategies.[33–35] Additionally, every stage of Scott's defined recovery process can contain more or less coping strategies: health care providers at the third stage,

called "restoring personal integrity" seek support by a trusted individual such as a peer, supervisor or personal confidant.[33] The seeking of emotional support resembles stage 5 of the recovery process, obtaining emotional first aid.[33] Disclosure of the error to family, friends or the patients can also be interpreted as a form of coping.[33] However, a systematic review of coping with medical error found that the published research did not fully close the gap in the knowledge about the coping strategies of individuals themselves and those around them, including their patients.[35]

The educational value of failure in other educational settings

While we found no literature that discussed allowing failure for educational purposes in residency training, our initial hand searching process did find a limited set of publications about the value of learning from failure, and of allowing or promoting failure for educational purposes in business administration, teaching, sports psychology, and childhood education. However, even in these publications, the phenomenon rarely gets deeply explored.

The value of failure is a common thread in this literature. For instance, pursuing Sim Sitkin's concept of intelligent failure, Amy Edmondson argued in a Harvard business report that failures have value because they can provide new knowledge that can help an organization leap ahead of the competition and ensure its future growth.[36] Similarly, in applied sports psychology, methods exist for harnessing failures for learning. According to Cremades and Tashman, novice sports practitioners' feelings of failure, doubt and criticism after a practice session can be harnessed for learning through case analysis:[37] learners talk through their real, video-taped sessions and use a "well–better–learned" reflection process to debrief themselves on their failures with their supervisors. In applied sports psychology, then, failure appears to be viewed as inevitable – something that will happen when novices are left alone to practice – and valuable.[38] But, while failure could be viewed as passively "allowed" by supervisors who leave their trainees to practice alone, we did not find a discussion of how supervisors might actively allow or promote failure for learning in this context. In contrast, in the education literature, we did find explicit discussion of allowing or promoting failure for the purposes of learning. One of the accepted concepts of early childhood education from Goldstein and Brooks (2002) is that learning from mistakes enables children to support their strengths, cope with adversity and develop a resilient mindset in the challenging world of today;[39] therefore, parents should not intervene over and over to keep children from making mistakes. Hascher and Hagenauer's chapter "learning from failure" supports the idea not only to learn from failure but also to see it as a chance to develop

and use it competently as a teacher in the classroom while setting up a safe learning environment.[40]

Kapur's concept of productive failure also reflects this philosophy:[41] his study of ninth-grade math students learning new mathematics concepts suggests that they learned more from their own failed solutions than from those of others, although in the absence of the opportunity to learn from their own failures they were better off trying to learn from others' failed solutions than from directive instruction. Even witnessing someone else's failure was more valuable for learning than being guided to the correct solution.[41] The concept of *allowing failure* also appears in the adult education literature, although it is less explicit. It is reflected in ideas such as providing a psychologically safe learning environment (Edmondson 2004) to allow adult learners to solve problems in collaboration and thus attain independence.[42–44] We found one instance where these ideas on allowing failure in education were picked up in a paper on post-graduate medicine. In a recent commentary on surgical education, Burlew referenced Goldstein and Brooks' arguments about the value of learning from mistakes in early childhood education, arguing that: "We have to allow them to make mistakes and learn from failure. How do our trainees learn how to deal with failure and not shrink from future action?[45] Burlew went on to say that "We as parents and educators could do it for them, and make it oh-so- much easier, but otherwise when will they ever really learn? … I need to allow each of them to do it themselves, while ultimately keeping the situation safe. They need to try to figure it out. And learn from the process. Taking calculated risks is part of this process of growing up. The interplay of risk and achievement is a critical aspect of one's identity and confidence."[45]

In summary, from these other literature resources, it is apparent that failure is purposely used in some situations and is acknowledged as an educational tool. However, only in one article did we find an explicit translation of this notion to postgraduate medical education.

Patient safety culture and its implications for learning from failure

Subsequent to the report by the Institute of Medicine (IOM),[46] the wider literature has brought forth refined definitions of medical errors, failures, and mishaps.[9,14] The IOM specified medical error as "the failure of a planned action to be completed as intended or the use of a wrong plan to achieve an aim".[46] According to Wu, a mistake is defined as "an act or omission by any caregiver which would have been judged wrong by knowledgeable peers at the time it occurred".[9]

Various process enhancements such as patient safety event reporting systems and patient safety checklists have been established in the health care community to reduce medical error and ensure a safer clinical environment for patients.[31] These process optimizations support the PSC in health care systems, and trainees should learn about the PSC through formal curricula and tools. Furthermore, under informal clinical supervision, residents learn effectively about patient safety.[47] Most of the papers we reviewed stated that a willingness to share examples of poor performance and take responsibility for failed actions is necessary for learning and teaching from failure.[9,14,15,48] However, very few of the publications considered the perceptions and understandings of trainees about their own mistakes with the implications for learning from failure. One exception was a cross-sectional analysis of PSC undertaken by Bump in 2015, which found that trainees had variable perceptions of PSC compared with national norms for practicing providers.[49] Residents and fellows stated lower PSC scores than practicing providers in six domains: teamwork within units, organizational learning –continuous learning, management support for patient safety, overall perceptions of patient safety, feedback and communication about error, and communication openness.[49] Additionally, trainees described higher PSC scores than practicing physicians in only two domains: supervisor/ manager expectations and actions promoting patient safety, and staffing.[49] Related to our research question, supervisors and organizations should be aware of these differences between the organizational, their own, and the trainee's perception of PSC. Overall, the results of Kroll et al.'s qualitative study of pre-registration house officers showed that learning in clinical training from failure depends on multiple factors such as recognition of the error, discussion with superiors, receiving specific and constructive feedback, and accepting appropriate responsibility.[30]

Discussion

Following the IOM report in 2000, "error" has tended to be the term used predominantly in the domain of healthcare:[46] other terms such as "failure," "mistake," "mishap," "incident," "near miss," and "adverse event" demanded their own definition and offer potential for further discussion.[9,11,14] This variety of terms used in this literature on resident failure suggests a lack of clarity in discussion of the phenomenon. We propose the term "allowing failure for educational purposes" as a consistent starting point for future research into this domain, but this will need to be refined as insights emerge from empirical research. While we learned that failure is used as an educational strategy in

settings outside of medicine,[37–41,45] the medical education literature identified in this review is silent on the idea of supervisors allowing trainees clinical failure as an educational strategy. One potential reason for this gap in our literature is that this educational approach is a taboo on formal discussion of this topic may exist due to the preeminent importance attached to patient safety in medicine. The PSC is one of the greatest assets in today's health care systems, and health care providers strive to perfect it by means of various process optimizations such as implementation of patient safety checklists or CIRS.[31] This gap in published knowledge is problematic, because if, as we suspect based on anecdotal information, that allowing failure is an informal educational strategy, then we require systematic understanding of it. However, a number of papers addressed related issues, such as how and what residents learn from the clinic errors they make,[14,15] the ongoing impact of such events, and the importance of failure for developing recovery strategies.[33] These studies did not explore how to optimize learning from failure in the clinical environment, but they did demonstrate that the experience of clinical failure is a profound one for trainees. Given that residents find their personal failures to be highly educational, there is potential for clinical supervisors to strategically support learning from failure. If supervisors are making judgments about when failure is appropriate and safe as a learning strategy, we need to understand the factors that go into those judgments. Learning from failure will depend on a number of factors, such as recognizing the error, discussing the event with superiors, and receiving specific and constructive feedback.[30] However, learning seems to depend on a sense of the personal responsibility, supported by residents' emotional response and patients' outcome.[30] Doctors regularly experience strong emotions in response to failures for which they feel responsible.[11,14,17,33] Additionally, learning from failure in residency is seen as a coping strategy.[17] We found hints in the literature that both strong emotions from failure and learning from failure as a coping strategy are associated with better learning.[9,14,16] The importance of emotions in the learning process of doctors is also suggested by studies reporting that the motivation to learn from failure correlates with its severity.[17] One can imagine that the memory of a mistake persists long term and is coupled with strong emotions such as distress, guilt, self-doubt, anger and frustration, as described in Engel et al.'s study.[17] These emotions can trigger a successful learning process, which may explain why the learning effect has been found to be deeper in the case of severe harm to the patient.[30] Overall, we have very limited knowledge of how emotions affect learning in situations of trainee failure, and we don't fully understand the role of a sense of responsibility for the failure either. We assume, from the studies of Fischer, Mazor, and Wu that responsibility is associated with a major impact on learning, but that it also means potentially negative emotions and both short- and long-term distress on the part of learners [9,14,16]

Conclusions

Using failure purposefully as material for informal teaching in daily clinical practice could be a powerful educational tool for supervisors in hospitals with resident training programs. But without knowing details of the social phenomenon of allowing failure in health care, supervisors can only guess where the balance lies between residents' sense of responsibility and their emotions, i.e., whether learning will be promoted or impeded. Future research to explore why, when, and how supervisors can apply this technique, its pedagogical benefits and drawbacks, its ethical implications, and its impact on resident learning is needed.

Limitations

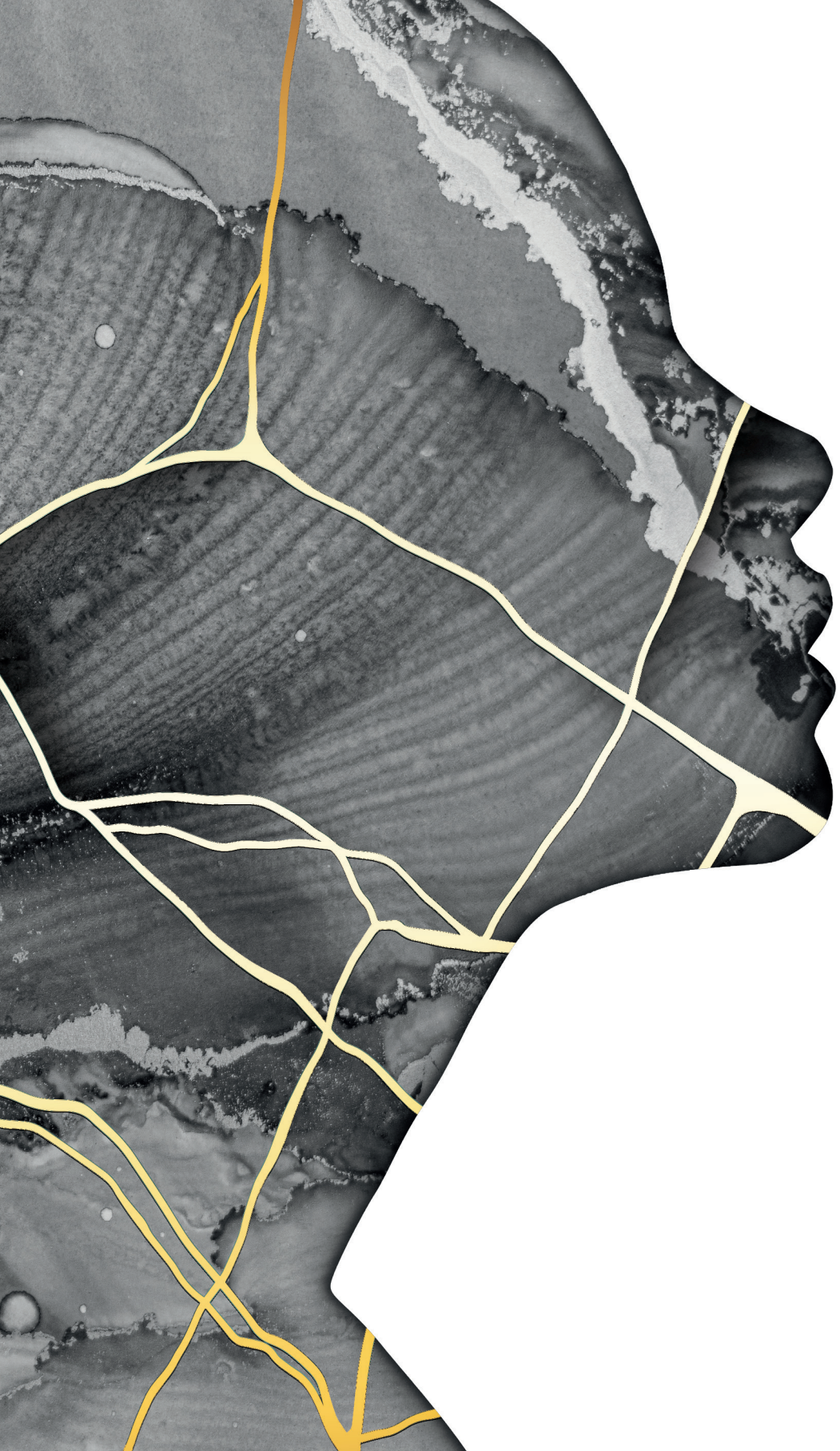
This narrative review was focused almost exclusively on the postgraduate medical education context. Therefore, we cannot speak to the extent to which allowing failure for educational purposes might manifest in literatures from other health professional domains, or from undergraduate or continuing medical education contexts. Further understanding of the literature related to this phenomenon in these domains and contexts will be necessary as we develop a robust understanding of its nature and implications in health professions education more broadly. While narrative review methodology does not make judgments regarding the quality of the papers analyzed, it does have the advantage of including a broad range of manuscripts, which makes us confident that, within the focus of postgraduate medical education, we have included all relevant published insights regarding this topic.

References

1. Kennedy, Robert F. Speech, June 6th, 1966. University of Cape Town, South Africa N.U.S.A.S. "Day of Affirmation." Presented at:
2. Robinson, Ken. TED Talk, Do schools kill creativity? February, 2006. Presented at:
3. Martin P, Kumar S, Lizarondo L. When I say … clinical supervision. Medical Education. 2017;51(9):890-891. doi:10.1111/medu.13258
4. Kilminster SM, Jolly BC. Effective supervision in clinical practice settings: a literature review. Med Educ. 2000;34(10):827-840.
5. Kennedy TJT, Regehr G, Baker GR, Lingard LA. 'It's a cultural expectation…' The pressure on medical trainees to work independently in clinical practice. Medical Education. 2009;43(7):645-653. doi:10.1111/j.1365-2923.2009.03382.x
6. Martin P, Copley J, Tyack Z. Twelve tips for effective clinical supervision based on a narrative literature review and expert opinion. Medical Teacher. 2014;36(3):201-207. doi:10.3109/0142159X.2013.852166
7. Grant MJ, Booth A. A typology of reviews: an analysis of 14 review types and associated methodologies: A typology of reviews, Maria J. Grant & Andrew Booth. Health Information & Libraries Journal. 2009;26(2):91-108. doi:10.1111/j.1471-1842.2009.00848.x
8. Singh H, Thomas EJ, Petersen LA, Studdert DM. Medical errors involving trainees: a study of closed malpractice claims from 5 insurers. Arch Intern Med. 2007;167(19):2030-2036. doi:10.1001/archinte.167.19.2030
9. Wu AW, Folkman S, McPhee SJ, Lo B. Do house officers learn from their mistakes? JAMA. 1991;265(16):2089-2094.
10. Walling HW, Veremakis C. Ordering errors by first-year residents: evidence of learning from mistakes. Mo Med. 2004;101(2):128-131.
11. Jagsi R, Kitch BT, Weinstein DF, Campbell EG, Hutter M, Weissman JS. Residents report on adverse events and their causes. Archives of internal medicine. 2005;165(22):2607-2613. doi:10.1001/archinte.165.22.2607
12. Katz-Navon T, Naveh E, Stern Z. Active learning: When is more better? The case of resident physicians' medical errors. Journal of Applied Psychology. 2009;94(5):1200-1209. doi:10.1037/a0015979
13. Volpp KGM, Grande D. Residents' Suggestions for Reducing Errors in Teaching Hospitals. New England Journal of Medicine. 2003;348(9):851-855. doi:10.1056/NEJMsb021667
14. Fischer MA, Mazor KM, Baril J, Alper E, DeMarco D, Pugnaire M. Learning from mistakes: Factors that influence how students and residents learn from medical errors. Journal of General Internal Medicine. 2006;21(5):419-423. doi:10.1111/j.1525-1497.2006.00420.x
15. Bradley CK, Fischer MA, Walsh KE. Trends in medical error education: Are we failing our residents? Academic Pediatrics. 2013;13(1):59-64. doi:10.1016/j.acap.2012.10.004
16. Mazor KM, Fischer MA, Haley HL, Hatem D, Quirk ME. Teaching and medical errors: Primary care preceptors' views. Medical Education. 2005;39(10):982-990. doi:10.1111/j.1365-2929.2005.02262.x
17. Engel KG, Rosenthal M, Sutcliffe KM. Residents?? Responses to Medical Error: Coping, Learning, and Change. Academic Medicine. 2006;81(1):86-93. doi:10.1097/00001888-200601000-00021
18. Hesketh EA, Bagnall G, Buckley EG, et al. A framework for developing excellence as a clinical educator. Med Educ. 2001;35(6):555-564.
19. Huffman-Dracht H. Resident Education in Medical Errors. 2010;The Open Emergency Medicine Journal, 2010, 3, 36-43.
20. Wong BM, Etchells EE, Kuper A, Levinson W, Shojania KG. Teaching quality improvement and patient safety to trainees: a systematic review. Acad Med. 2010;85(9):1425-1439. doi:10.1097/ACM.0b013e3181e2d0c6
21. Bohnen JMA, Lingard L. Error and Surgery: Can We Do Better? Vol 46.; 2003.
22. Walsh KE, Miller MR, Vinci RJ, Bauchner H. Pediatric Resident Education About Medical Errors. Ambulatory Pediatrics. 2004;4(6):514-517. doi:10.1367/A04-009R1.1

23. Farnan JM, Petty LA, Georgitis E, et al. A Systematic Review: The Effect of Clinical Supervision on Patient and Residency Education Outcomes. Academic Medicine. 2012;87(4):428-442. doi:10.1097/ACM.0b013e31824822cc
24. Walton M, Harrison R, Burgess A, Foster K. Workplace training for senior trainees: a systematic review and narrative synthesis of current approaches to promote patient safety. Postgrad Med J. 2015;91(1080):579-587. doi:10.1136/postgradmedj-2014-133130
25. Ross PT, McMyler ET, Anderson SG, et al. Trainees' perceptions of patient safety practices: recounting failures of supervision. Jt Comm J Qual Patient Saf. 2011;37(2):88-95.
26. Irby DM. Excellence in clinical teaching: knowledge transformation and development required. Medical Education. 2014;48(8):776-784. doi:10.1111/medu.12507
27. Moulton CA, Regehr G, Lingard L, Merritt C, MacRae H. Operating from the Other Side of the Table: Control Dynamics and the Surgeon Educator. Journal of the American College of Surgeons. 2010;210(1):79-86. doi:10.1016/j.jamcollsurg.2009.09.043
28. Mazor KM, Fischer M a, Haley HL, Hatem D, Rogers HJ, Quirk ME. Factors influencing preceptors' responses to medical errors: a factorial survey. Academic medicine : journal of the Association of American Medical Colleges. 2005;80(10 Suppl):S88-92. doi:10.1097/00001888-200510001-00024
29. Kilminster S, Cottrell D, Grant J, Jolly B. AMEE Guide No. 27: Effective educational and clinical supervision. Med Teach. 2007;29(1):2-19. doi:10.1080/01421590701210907
30. Kroll L, Singleton A, Collier J, Rees Jones I. Learning not to take it seriously: junior doctors' accounts of error. Medical Education. 2008;42(10):982-990. doi:10.1111/j.1365-2923.2008.03151.x
31. Louis MY, Hussain LR, Dhanraj DN, et al. Improving Patient Safety Event Reporting Among Residents and Teaching Faculty. Ochsner J. 2016;16(1):73-80.
32. Walton M, Barraclough B. Clinical supervisors: are they the key to making care safer? BMJ quality & safety. 2013;22(8):609-612. doi:10.1136/bmjqs-2012-001637
33. Scott SD, Hirschinger LE, Cox KR, McCoig M, Brandt J, Hall LW. The natural history of recovery for the healthcare provider "second victim" after adverse patient events. Quality and Safety in Health Care. 2009;18(5):325-330. doi:10.1136/qshc.2009.032870
34. Wu AW. Medical error: the second victim. The doctor who makes the mistake needs help too. BMJ. 2000;320(7237):726-727.
35. Sirriyeh R, Lawton R, Gardner P, Armitage G. Coping with medical error: a systematic review of papers to assess the effects of involvement in medical errors on healthcare professionals' psychological well-being. BMJ Quality & Safety. 2010;19(6):e43-e43. doi:10.1136/qshc.2009.035253
36. Edmondson A. Strategies of learning from failure. Harv Bus Rev. 2011;89(4):48-55, 137.
37. Cremades JG [Ed], Tashman LS [Ed]. Global Practices and Training in Applied Sport, Exercise, and Performance Psychology: A Case Study Approach.; 2016. http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=psyc13&NEWS=N&AN=2016-22615-000
38. Woodcock C, Richards H, Mugford A. Quality Counts: Critical Features for Neophyte Professional Development. Sport Psychologist. 2008;22(4):491-506.
39. Brooks R, Goldstein S. Raising Resilient Children: A Curriculum to Foster Strength, Hope, and Optimism in Children.; 2002. doi:10.3109/09638237.2011.613958
40. Hascher T, Hagenauer G. Lernen aus Fehlern. In: Spiel, Christiane, Schober, Barbara, Wagner Petra RR, ed. Bildungspsychologie. Hogrefe; 2010:457.
41. Kapur M. Productive Failure in Learning Math. Cognitive Science. 2014;38(5):1008-1022. doi:10.1111/cogs.12107
42. Edmondson A. Learning from failure in health care: frequent opportunities, pervasive barriers. Quality and Safety in Health Care. 2004;13(suppl_2):ii3-ii9. doi:10.1136/qshc.2003.009597
43. Kennedy TJT, Regehr G, Baker GR, Lingard LA. Progressive independence in clinical training: a tradition worth defending? Academic medicine : journal of the Association of American Medical Colleges. 2005;80(10):106-111. doi:10.1097/00001888-200510001-00028
44. Kennedy TJT, Lingard L, Baker GR, Kitchen L, Regehr G. Clinical Oversight: Conceptualizing the Relationship Between Supervision and Safety. Journal of General Internal Medicine. 2007;22(8):1080-1085. doi:10.1007/s11606-007-0179-3

45. Burlew CC. Surgical education: Lessons from parenthood. American journal of surgery. Published online September 2017. doi:10.1016/j.amjsurg.2017.09.014
46. Institute of Medicine (US) Committee on Quality of Health Care in America. To Err Is Human: Building a Safer Health System. (Kohn LT, Corrigan JM, Donaldson MS, eds.). National Academies Press (US); 2000. Accessed April 26, 2020. http://www.ncbi.nlm.nih.gov/books/NBK225182/
47. Baldwin DWC, Daugherty SR, Ryan PM. How Residents View Their Clinical Supervision: A Reanalysis of Classic National Survey Data. Journal of Graduate Medical Education. 2010;2(1):37-45. doi:10.4300/JGME-D-09-00081.1
48. O'Connor P, Byrne D, O'Dea A, McVeigh TP, Kerin MJ. "Excuse me:" teaching interns to speak up. Jt Comm J Qual Patient Saf. 2013;39(9):426-431.
49. Bump GM, Calabria J, Gosman G, et al. Evaluating the Clinical Learning Environment: Resident and Fellow Perceptions of Patient Safety Culture. Journal of Graduate Medical Education. 2015;7(1):109-112. doi:10.4300/JGME-D-14-00280.1



3

‘Whatever you cut, I can fix it’: clinical supervisors’ interview accounts of allowing trainee failure while guarding patient safety

Published as
Klasen JM, Driessen E, Teunissen PW, Lingard LA.
‘Whatever you cut, I can fix it’: clinical supervisors’ interview accounts of allowing trainee failure while guarding patient safety.
BMJ Qual Saf. 2020 Sep;29(9):727-734.

Abstract

Background
Learning is in delicate balance with safety, as faculty supervisors try to foster trainee development while safeguarding patients. This balance is particularly challenging if trainees are allowed to experience the educational benefits of failure, acknowledged as a critical resource for developing competence and resilience. While other educational domains allow failure in service of learning, however, we do not know whether or not this strategy applies to clinical training.

Methods
We conducted individual interviews of clinical supervisors, asking them whether they allowed failure for educational purposes in clinical training and eliciting their experiences of this phenomenon. Participants' accounts were descriptively analysed for recurring themes.

Results
Twelve women and seven men reported 48 specific examples of allowing trainee failure based on their judgement that educational value outweighed patient risk. Various kinds of failures were allowed: both during operations and technical procedures, in medication dosing, communication events, diagnostic procedures and patient management. Most participants perceived minimal consequences for patients, and many described their rescue strategies to prevent an allowed failure. Allowing failure under supervision was perceived to be important for supporting trainee development.

Conclusion
Clinical supervisors allow trainees to fail for educational benefit. In doing so, they attempt to balance patient safety and trainee learning. The educational strategy of allowing failure may appear alarming in the zero-error tolerant culture of healthcare with its commitment to patient safety. However, supervisors perceived this strategy to be invaluable. Viewing failure as inevitable, they wanted trainees to experience it in protected situations and to develop effective technical and emotional responses. More empirical research is required to excavate this tacit supervisory practice and support its appropriate use in workplace learning to ensure both learning and safety.

Introduction

Healthcare professionals have a complex relationship to failure. Because of the mandate to provide safe, high quality patient care, failures are likely to be stigmatised,[1–4] and provoke emotional distress with feelings of shame, guilt and self-doubt in providers.[5–7] At the same time, however, health professionals understand that failure at some point in their career is inevitable[8,9] and valuable for learning,[10–13] particularly in training when novices will work at the edge of their competence to develop technical skills,[14–16] gain adaptive expertise[17] and acquire failure management strategies.[18] With the rise of the patient safety movement, however, opportunities to learn from failure may be in decline as supervision increases and trainee autonomy decreases. Paradoxically, this may jeopardise safety by not equipping new graduates to face the realities of critical care.[19–21] In other educational settings where safety is a less overt concern, such as education and psychology, failure is not only supported, it is also promoted: educational activities are carefully structured to provoke learner failure in order to drive learning and cultivate resilience.[22–28] The recently presented Prevention-Permission-Promotion Framework described three approaches to errors during learning.[29] The 'error prevention' approach is supported in medicine: we teach our learners to avoid making errors and to observe others' errors.[29] The 'error permission' approach allows errors to arise naturalistically during learners exploratory or trial-and-error activities, supported by corrective feedback.[29] The 'error promotion' approach goes a step further, where learners are actively induced or guided to make errors. Importantly, however, both of the last approaches to allowing and promoting failure derives from 'low stakes' contexts, such as paper-based exercises or simulation-based learning activities,[22,29,30] so that little is known about how they might translate to workplaces, or more high stakes learning contexts.

Research into the learning affordances of workplace error suggests that it may be particularly challenging to embrace such an approach in healthcare, especially given the primacy of patient safety as a professional value.[31] With the certainty of failure in both medical training and medical practice, however, we should consider the educational potential of failure in healthcare environments as well. Scholars are beginning to ask, how does the experience of failure equip physicians with both clinical strategies to repair their failures and community supports to remain resilient in the face of them, and what might be the role of the clinical supervisor in this experience?[32] While supervisors could conceivably use failure strategically for learner development the way educators in other domains do,[32] our recent review of the literature revealed no discussion about the phenomenon

of allowing failure in supervised clinical training, even though failures were recognised as important learning opportunities for trainees.[33] The current study explored supervisors' experiences of allowing failure in the medical workplace to address this gap.

Methods

Study design

The work reported in this paper comes from a qualitative research programme exploring if and how supervisors and trainees experience the phenomenon of allowing failure as an educational strategy in postgraduate clinical training. This study followed constructivist grounded theory methodology to explore a phenomenon based on social process interactions, which it is not yet explained by pre-existing theory.[34] A constructivist approach allowed us to bring sensitising concepts such as 'failure' and 'learning' to bear during data collection and analysis, in order that we can engage with and build on existing literature even while the central grounded theory principle of attending to emergent themes is upheld.[35] Because we acknowledge that the social interactions of supervisors and residents regarding allowing failure take place within the workplace learning environment, we employ sensitising concepts from experiential learning theory.[36]

Constructivist grounded theory acknowledges that researchers bring their orientations to the work. Our collaboration of two insiders (JMK and PWT, both past residents and current clinical faculty) and two outsiders (LAL and ED, with experience studying teamwork, workplace-based learning and competency-based assessment practices but no personal role in those settings) affords the opportunity to reflect on how our orientations inform the nature of the data we will collect and the analytical patterns we will be attuned to see. Reflective memoing and regular research meetings were used to continuously engage our perspectives during the research process. As the interviewer, JMK's role as a surgeon with experience working in critical care and emergency departments offered the advantage that familiarity with the topic helped her understand participants' stories. We anticipated that this would help encourage the participants to share their experiences candidly. JMK is a near-peer to some participants, and most of the participants had some form of acquaintance with the interviewer, knowing each other through professional networks. Recognising that this familiarity, however, could also be a disadvantage, potentially limiting the depth of explanation in participants' responses and influencing interpretation of the data, LAL added a non-physician perspective in weekly meetings. PWT and ED shared additional insights in regular meetings.

Participant recruitment and sampling

In order to maintain confidentiality within the surgical and medical education community, we invited possible participants via email or personal request. Twenty-one participants agreed to an interview; 19 were required for sampling sufficiency. Because we recruited participants from two countries, Switzerland and Canada, and for convenience of some participants, we interviewed eight by video call. Participants from Switzerland were non-native English speakers, as was the interviewer (JMK). Participation was voluntary and participants did not receive any compensation for their contribution to the study; all signed for informed consent. Participants were aware that the study would specifically ask about whether and how supervisors allow failure in their trainees in the clinical workplace. Participants knew who the interviewer was, that she had medical education background and experience both as a past clinical trainee and as a current clinical supervisor. We started by interviewing more experienced supervisors or those in leadership positions (consultant or department chief, P1–P6), who we expected to be confident in their clinical expertise or supervisory style and therefore perhaps more willing to discuss the potentially sensitive topic of allowing clinical failure in the course of training. Also, as a rapport-building strategy, we started with supervisors from surgery (P1, P2, P5), critical care (P3) or emergency medicine (P4), as the interviewer has experience in these clinical settings. Sampling was then expanded to other specialties, including obstetrics and gynaecology, internal medicine, anaesthesia, paediatrics and psychiatry (from P6 onwards). Clinical supervisors earlier in their careers and with less experience were included later in the process (from P7 onwards). Owing to the sensitivity of the topic, if a supervisor was not familiar with the subject through prior discussions or seemed insecure at the beginning of the interview, we began with broader questions about whether the participant had ever seen a trainee make a mistake in a clinical situation. After the first few interviews, we ensured that most of the remaining study participants had formal training in medical education or at least experience in medical education (e.g., participation in a simulation instructor course or medical education courses) in order to receive richer and potentially more reflective responses.

Data collection and analysis

With Swiss and Canadian institutional research ethics approvals, we individually interviewed 19 clinical supervisors asking them whether they had allowed failure for educational purposes, requesting specific examples, and probing to explore how and why supervisors made the decision to use this strategy. Both purposeful and theoretical sampling were employed, to secure information-rich participants who were reflective and interested in the study question and to

pursue recurring themes as they were identified in the iterative constant comparison of the data analysis.[37] Each semi-structured interview lasted between 45 min and 75 min, was audio-recorded and subsequently transcribed verbatim with anonymising protocols to remove person and place identifiers. Transcripts were not returned to participants for member checking. Post interview field notes were made after each interview and supported the reflexivity process. The semi-structured interview guide was recursively refined to explore emerging themes. Data sufficiency, or a robust and stable description of the dimensions involved in the phenomenon of allowing trainee failure, was reached after 17 interviews. Two more participants were interviewed to confirm the description. Participant 18 was one of two discrepant cases, denying use of this educational strategy but nevertheless providing examples that fit the description we had created. Participant 19 offered confirmatory information and additional examples but did not alter the definition. We conducted a qualitative content analysis of each specific account that supervisors shared about having allowed a trainee to fail for educational purposes, with the aim of systematically describing the dominant features of the phenomenon.[38] All transcripts were coded by JMK, while LAL read and discussed with JMK four transcripts in detail and fully coded one in parallel. Themes were derived from the data and refined until they were stable and consistent. The content data analysis was supported by Excel tables and a Mind map, created with Mind Node.

The participants (P1–P19) shared 79 specific experiences of failure in clinical training, including those from their own residency. The qualitative content analysis followed Hsieh and Shannon's framework,[38] starting with closely and repeatedly reading these examples and inductively developing codes to reflect recurring patterns in them. As these became more refined and stable in categories, we began to develop a preliminary definition of allowing failure. Using this definition, we revisited all 79 examples to separate the examples that met all the criteria from those that did not. In this process, we identified 31 examples that did not fully reflect the definition. Consequently, the results presented here are based on a final analysis of the 48 included examples.

Results

Twelve women and seven men from 11 different institutions participated in the study (table 1). The participants represented the medical specialties of emergency medicine, critical care, internal medicine, paediatrics, and psychiatry, and the surgical specialties of general surgery and obstetrics and gynaecology. Their expertise as clinical supervisors ranged from 2 years to 18 years.

Table 1: Demographic data

CHARACTERISTICS	NUMBER
Gender	
Female	12
Male	7
Supervisory experience	
2 - 5 years	2
5 - 10 years	9
10 - 15 years	7
> 15 years	1
Speciality	
General surgery	3
Emergency medicine	4
Critical care / anaesthesia	3
Obstetrics / gynaecology	2
Internal medicine, including medical specialties, for example gastroenterology	4
Paediatrics	2
Psychiatry	1

Seventeen of the 19 participants acknowledged that they allowed trainees to fail in clinical situations for educational purposes. The remaining two participants denied using this strategy; however, they shared examples that fit the definition emerging from our analysis. While each of the 17 participants shared between one and four accounts of allowing failure, they gave the impression that they could have shared more had time allowed. These supervisors acknowledged that allowing failure was commonplace: it 'happens regularly' (P19); 'during the whole hospital daily business. You often let them do mistakes….' (P2). One estimated that they '…probably use it now once a week' (P3) and another

declared that '…it seems to be quite a good strategy I use quite often. So, during nightshifts, I use it once or twice in a week of nightshifts.' (P7) (online supplementary file 1: Representative example of allowing failure: an experienced clinical supervisor reported allowing a resident to fail (twice) under direct supervision during two C-sections in two night shifts, Panel 1).

From the analysis, we developed a definition of the phenomenon of allowing failure in clinical training as follows: *While supervising a trainee's clinical performance, the supervisor detects an imminent trainee mistake, has the opportunity to intervene but deliberately chooses not to do so because the educational gain for the trainee is perceived to outweigh the (potential) consequences for the patient*. Below we describe and illustrate each part of this definition.

The participants perceived that they must have some form of oversight of the trainee performance in order to allow failure. We followed established definitions of supervision to analyse the supervisory situations in the accounts.[39] Most involved direct or immediately available supervisory situations, such as in the elaborated C-section account (online supplementary file 1), while three participants reported local or distant supervision, such as psychotherapy provision: '(when) I'm not there with them, and I may have a hypothesis of a possible mistake or outcome. But it's almost like I have to really not interject that because the learning for the resident is more powerful if they develop their own hypothesis and act accordingly in the moment.' (P12) Participants' accounts of allowing failure involved a wide variety of clinical performances. They included technical or manual failures such as misplacing a trocar in laparoscopic procedures (P1), selecting the wrong plane during operations (P5) or using the wrong angle for a lumbar puncture (P16); medication failures such as overdosing or underdosing of a drug (P3, P18); communication failures, such as a misleading consultation with a patient (P14); diagnostic failures, such as selecting the wrong ultrasound programme (P7); decision-making failures such as using ultrasound instead of a CT-scan (P4); and patient management and organisation failures, such as planning insufficient follow-up (P12) (Online supplementary file 2: Samples of allowing failure, categorised in clinical performance types).

Participants also described a wide range of possible consequences of these failures. They tended to focus on patient outcomes, rather than consequences for trainees or supervisors, and they emphasised that these consequences should be 'really small' (P1), 'not dangerous' (P5) and that they wouldn't 'let the patients suffer too much' (P2). However, potential consequences for patients included pain (P2, P3); bleeding or haematoma (P1, P2, P5, P7, P13); potential suboptimal wound healing or skin incisions (P5, P8); multiple, wrong, or painful punctures (P3, P8, P16, P19); excessively deep sedation (P14); longer waiting time or delay in patient care (P4, P11, P16).

In most of the reported accounts, the consequences were anticipated by the supervisor and one articulated the strategy to rescue precisely: 'Or, for example, I remember I had a patient where I put in the trocars and I said, be sure to take care of the epigastric vessels, and I saw he didn't, but I knew, okay I can put an endo close… .' (P5). Not all consequences were anticipated, prompting unplanned rescues, as in an account where the supervisor allowed the trainee to try a surgical procedure in a different way than the supervisor's preferred approach: 'You get one try your way and if it doesn't work, we're doing it my way. He did it his way and it ended up causing more of a complication intraoperatively that we then had to go and fix it. It ended up being fine in the end, fortunately.' (P13). In direct supervision, supervisors explicitly referred to themselves as a safety net that could be invoked when needed, such that trainees could be allowed to 'experience the mistake, while I was there as a backup' (P8) or in a medication example: 'I probably thought I would be quick enough afterwards to be able to correct or to counterbalance whatever she did.' (P3). Some direct supervisors also reported allowing a failure initially and then intervening to prevent that failure from having a potentially unacceptable outcome for the patient. These 22 examples of calculated rescuing included redirecting trainee-patient conversations (P14, P17), taking over the manoeuvre to get the baby out of the womb (P7), interrupting or changing a treatment plan (P4, P6), acting to stop bleeding (P13) or moving back in the colon to resect an overlooked polyp during colonoscopy (P19).

The choice to step back and give trainees space to learn through experience was commonplace in participants' accounts of allowing failure. One 'condone[d] a time delay… so that (the trainee) can think autonomously and act independently' (P4) as a way of deepening their learning. One emergency physician estimated that they would allow an unsuccessful communication exchange to go on for 'like five, ten minutes, and then (the resident) comes to a point where they sort of hit a wall. And then I often say, we'll discuss our plan and your concerns, and we'll get back to you. And we leave the room and I discuss the situation with the resident. What do we do now? And what can we do differently?' (P14). A surgical supervisor explained how they consciously 'would leave them much more alone and do mistakes…like I tell them 'put in the negative pressure bandage' and then it would be way too much of the black foam. And then I would go and say, look now what happens to the wound, next time we'll do it together because it's

important to narrow the wound….' (P5). Sometimes supervisors reflected that they were allowing trainees latitude to try approaches different from their own:

> Basically, I tell them …there are a hundred methods to do (reposition a joint), take the method you want, but you have to know what you are doing … Like if they explain me okay, I will do it like that and that and they don't mention that they have to reposition the patient I'll say well you are the one who's doing it. I'm just here and I just do what you tell me to do. Then if they fail then I'll show them how to reposition the patient and how it makes it easier. P11

The educational value of standing back during supervision was felt to be profound: as one supervisor reflected, 'I think it was one of [the trainee's] strongest night shifts because then she suddenly recognised how life can be when your supervisor doesn't interact just in the moment, but just sorts the problem afterwards' (P7). Further, supervisors emphasised how valuable they thought the experience of failure was for trainees' learning process. Failure was perceived as particularly powerful in its ability to provide trainees with sensory feedback for tasks or situations. For instance, an emergency doctor explained 'especially this (lumbar puncture), it's something you have to feel where you have to get in with the needle and if the angle is not correct, you always hit the bone.' (P16). And a critical care supervisor felt it was important for the trainee 'to have lived the experience, to know the feeling of it for further situations, knowing that you intubated wrongly.' (P8). Supervisors also acknowledged the emotional impact of failure as part of its educational power: 'I think for (the trainee) it was horrible because she was so self-confident that she thought she will manage, and nevertheless, I think she learnt a lot in the moment she had to do it.' (P7). Finally, supervisors perceived that experience failure is inevitable in medicine. Therefore, they reasoned that it is better for trainees to fail under supervision than when they are working unsupervised because 'then they have the chance to practice the failure management in a setting with me' (P8); a trainee can '… learn from a situation that you have experienced yourself and know what happened and how to deal with complications' (P4). Supervisors reflected that feedback played an important role for learning from allowing failure. For instance, the supervisor involved in the C-section account (online supplementary file 1) detailed when and how she gave feedback, to ensure that the trainee will develop her anatomical knowledge, which the supervisor viewed as the basis of her failure.

Discussion

Our findings suggest that allowing failure for educational purposes is not an uncommon pedagogical strategy in medicine. All participants described accounts of error permission (allowing errors to arise in naturalistic ways, and not preventing them), but none described using error promotion (purposefully adding challenge to elicit errors, or leading learners into specific errors).[29] Medical education is familiar with both approaches in simulated training environments.[40,41] However, our results demonstrate that the practice of error permission extends into authentic clinical work, which raises a number of critical questions. First, how is this strategy compatible with our patient safety culture? Healthcare tends to have a zero-tolerance approach to error,[42] given the primacy of patient safety[43] and healthcare's consequent 'First, do no harm' guiding principle for clinicians.[44] In our data, although supervisors endeavoured to limit patient consequences, a range of potential and even actual harm was described. While these narrative accounts cannot claim causality, they are illustrative of the stakes involved when supervisors balance patient risk and trainee benefit; the sense of supervisory responsibility and need for rescue when the balance goes off; and the factors that may increase the potential for supervisors to misjudge. These factors likely include supervisory distance, as supervisors' abilities to infer consequences may be more attenuated the further they get away from direct supervision contexts.[16,45] Trainee learning and patient safety are conventionally seen as being in binary relationship to one another, with supervisors having to choose one or the other.[46] But we would argue that this binary is both infeasible and undesirable: infeasible because the very presence of learners promises inexpert clinical performance which, in theory, threatens patient safety, and undesirable because, given the complexity of healthcare, physicians need to learn how to fail and recover, both technically and emotionally. Our participants' accounts of allowing failure suggest that they attempt to negotiate or balance these values, by affording just enough independence to the trainees that they will learn from an error experience, without creating undue risk to the patient. What we don't yet understand sufficiently is how supervisors negotiate this balance: what social and cognitive processes inform their decisions to allow failure for learning in one clinical episode, but not in another?

Second, if we accept that supervisors can balance, rather than choose between, learner development and patient safety, what kinds of failures can be allowed for learning? What supervisors described as a 'failure' varied across the sample, from an insufficient communication with a patient, to an improper angle for a

lumbar puncture, to an insufficient medication dose for clinical effect. We anticipate that readers might view some of these as 'real failures' but not others. This variety and divergence of perception may reflect what Billett calls the 'relational interdependencies' of workplace learning: what constitutes an error depends on social factors and on personal preferences, which influence what is defined as an error in one setting (but not another), who defines whether an error has occurred (in our context, the clinical supervisor) and whether productive learning arises from it.[31] Participants also explicitly debated whether these events should be referred to as mistakes, failures or errors, or whether they simply constituted different styles or approaches from that preferred by the supervisor. This ambiguity, which is also present in the literature on learning from failures,[31,33] has implications if communities of clinical supervisors are going to engage in discussions to develop shared expectations for using this educational strategy. Finally, our results illustrate that the relationship between failure and consequence is varied: not all failures lead to patient consequences, and not all consequences can be anticipated. This has implications for supervisors' ability to enact rescue strategies. How supervisors anticipate failures and consequences, and how they make judgements about whether to allow them, is the focus of an ongoing analysis of interview data beyond the narrative accounts in this study. Third, what is the educational impact of allowed failure? Supervisors in our study were consistent in viewing failure as a powerful, and necessary, educational strategy. Their accounts reflect the philosophy, supported by the Institute of Medicine report in 1999,[9] that failure is inevitable in medical practice, and, consequently, trainees will experience it eventually. Supervisors advocated failing with supervision as preferable to failing without, both for the patient and for the trainee, echoing concerns that resident errors arise from lack of supervision and policies that demand increased supervision.[47–50] Their accounts also reflected medical education's strongly held value of progressive independence, the notion that trainees must be allowed increasing independence if they are to graduate prepared for practice.[51] Our results suggest that supervisors appreciate their moment-to-moment supervisory decisions about allowing such independence as both inherently risky and ultimately necessary for trainees to develop into safe practitioners. We need more research on what — and whether — trainees have learnt, to better understand which sorts of failure episodes might be most educational for particular learners in particular situations.

One theory that might inform our understanding of what trainees learn from failure is that of negative knowledge, drawn from experiential learning theory: this is 'explicit knowledge about what not to do in certain situations'.[52] Expertise is knowing what to do and doing it effectively, it is also knowing 'what not to do

and thus (having) the ability to avoid errors and to intercept and interdict unproductive lines of thought during performance'.[52] In allowing trainees to experience 'critical episodes which are perceived as 'wrong, but relevant'',[51] such as the 'feeling' of a wrong angle for lumbar puncture or a poor intubation attempt, our participants were supporting trainees' development of 'negative expertise'.[53] Importantly, the theory of negative knowledge stresses the importance of analysis and reflection to maximise learning from critical negative episodes. While the accounts we analysed offered some examples of supervisors debriefing failure episodes with trainees, further research is required to understand how supervisors employ feedback and reflection when allowing failure, and how trainees experience them.

Finally, what are the implications of allowing failure for supervisory relationships and trainee wellness? The culture of clinical supervision has seen an important shift in recent decades, from being characterised by hierarchy, bullying and mistreatment[54,55] to being predicated on supportive, constructive supervisory relationships.[39,56,57] This shift reflects increasing concern with fostering well-being and resilience in order to combat burnout and dropout.[58–60] In order to allow trainees to fail without risking a return to a culture of supervisory mistreatment, [61] we need careful attention to how trainees are responding emotionally to their failure experiences, as emotions can either deepen learning or impede it, depending on their valence.[62] The understanding of the phenomenon could then be used to support explicit discussion and faculty development with regard to how to appropriately judge the balance between resident learning and patient safety in our field.

Limitations

In interview research, the role of the interviewer has a strong influence on the data collected. As a young surgical consultant and medical education researcher, the interviewer in this study (JMK) was able to develop a rapport with participants given her own experience as both trainee and supervisor. However, interviewing of near-peers may have led to acquiescence bias. While our sample of 48 accounts from 19 participants was theoretically sufficient to support a rich preliminary sketch of this phenomenon, further research is required to develop deeper insight into the nature of this phenomenon in particular settings. Nuanced distinctions of which our data offer hints, such as those between direct and distant supervisory contexts, will require more purposeful sampling of such contexts in order to explore.

Conclusion

We recognise that we have described a practice — allowing failure for educational purposes —that may concern and discomfort readers committed to patient safety. However, given that such a practice appears to be in use among our participants, we should be explicitly discussing it in our clinical supervisory communities. Towards this end, we hope that clinical supervisors will use the definition we have put forward in this study as a starting point for discussing the educational strategy of allowing failure and developing a shared set of conditions and expectations that is reflective of the nature of supervision, the type of clinical performance, the potential for both anticipated and unexpected consequences, and the strategies that can be put in place to maximise trainee learning and avoid patient harm.

References

1. Collins ME, Block SD, Arnold RM, Christakis NA. On the prospects for a blame-free medical culture. Social Science & Medicine. 2009;69(9):1287-1290. doi:10.1016/j.socscimed.2009.08.033
2. Dickey J, Damiano, RJ, Ungerleider R. Our surgical culture of blame: A time for change. The Journal of Thoracic and Cardiovascular Surgery. 2003;126(5):1259-1260. doi:10.1016/S0022-5223(03)01195-4
3. Radhakrishna S. Culture of blame in the National Health Service; consequences and solutions. British Journal of Anaesthesia. 2015;115(5):653-655. doi:10.1093/bja/aev152
4. Ferguson CC. The Emotional Fallout From the Culture of Blame and Shame. JAMA Pediatrics. 2017;171(12):1141. doi:10.1001/jamapediatrics.2017.2691
5. Bynum WE, Artino AR, Uijtdehaage S, Webb AMB, Varpio L. Sentinel Emotional Events: The Nature, Triggers, and Effects of Shame Experiences in Medical Residents. Academic Medicine. 2019;94(1):85-93. doi:10.1097/ACM.0000000000002479
6. LaDonna KA, Ginsburg S, Watling C. Shifting and Sharing: Academic Physicians' Strategies for Navigating Underperformance and Failure. Academic Medicine. 2018;93(11):1713-1718. doi:10.1097/ACM.0000000000002292
7. Shepherd L, LaDonna KA, Cristancho SM, Chahine S. How Medical Error Shapes Physicians' Perceptions of Learning: An Exploratory Study. Academic Medicine. Published online April 2019:1. doi:10.1097/ACM.0000000000002752
8. Reason J. Understanding adverse events: human factors. Qual Health Care. 1995;4(2):80-89.
9. Institute of Medicine (US) Committee on Quality of Health Care in America. To Err Is Human: Building a Safer Health System. (Kohn LT, Corrigan JM, Donaldson MS, eds.). National Academies Press (US); 2000. Accessed April 26, 2020. http://www.ncbi.nlm.nih.gov/books/NBK225182/
10. Fischer MA, Mazor KM, Baril J, Alper E, DeMarco D, Pugnaire M. Learning from mistakes: Factors that influence how students and residents learn from medical errors. Journal of General Internal Medicine. 2006;21(5):419-423. doi:10.1111/j.1525-1497.2006.00420.x
11. Bradley CK, Fischer MA, Walsh KE. Trends in medical error education: Are we failing our residents? Academic Pediatrics. 2013;13(1):59-64. doi:10.1016/j.acap.2012.10.004
12. Mazor KM, Fischer MA, Haley HL, Hatem D, Quirk ME. Teaching and medical errors: Primary care preceptors' views. Medical Education. 2005;39(10):982-990. doi:10.1111/j.1365-2929.2005.02262.x
13. Mazor KM, Fischer M a, Haley HL, Hatem D, Rogers HJ, Quirk ME. Factors influencing preceptors' responses to medical errors: a factorial survey. Academic medicine : journal of the Association of American Medical Colleges. 2005;80(10 Suppl):S88-92. doi:10.1097/00001888-200510001-00024
14. Regehr G, Mylopoulos M. Maintaining competence in the field: Learning about practice, through practice, in practice: Journal of Continuing Education in the Health Professions. 2008;28:19-23. doi:10.1002/chp.203
15. Rolfe IE, Sanson-Fisher RW. Translating learning principles into practice: a new strategy for learning clinical skills. Medical Education. 2002;36(4):345-352. doi:10.1046/j.1365-2923.2002.01170.x
16. Dijksterhuis MGK, Voorhuis M, Teunissen PW, et al. Assessment of competence and progressive independence in postgraduate clinical training. Medical Education. 2009;43(12):1156-1165. doi:10.1111/j.1365-2923.2009.03509.x
17. Mylopoulos M, Steenhof N, Kaushal A, Woods NN. Twelve tips for designing curricula that support the development of adaptive expertise. Medical Teacher. 2018;40(8):850-854. doi:10.1080/0142159X.2018.1484082
18. Keith N. Managing Errors During Training. In: Bauer J, Harteis C, eds. Human Fallibility. Vol 6. Springer Netherlands; 2012:173-195. doi:10.1007/978-90-481-3941-5_11
19. Dacey RG, Nasca TJ. Seniorization of Tasks in the Academic Medical Center: A Worrisome Trend. Journal of the American College of Surgeons. 2019;228(3):299-302. doi:10.1016/j.jamcollsurg.2018.11.009
20. Halpern SD, Detsky AS. Graded Autonomy in Medical Education — Managing Things That Go Bump in the Night. N Engl J Med. 2014;370(12):1086-1089. doi:10.1056/NEJMp1315408

21. Mattar SG, Alseidi AA, Jones DB, et al. General Surgery Residency Inadequately Prepares Trainees for Fellowship: Results of a Survey of Fellowship Program Directors. Annals of Surgery. 2013;258(3):440-449. doi:10.1097/SLA.0b013e3182a191ca
22. Kapur M. Productive Failure in Learning Math. Cognitive Science. 2014;38(5):1008-1022. doi:10.1111/cogs.12107
23. Kapur M. Examining Productive Failure, Productive Success, Unproductive Failure, and Unproductive Success in Learning. Educational Psychologist. 2016;51(2):289-299. doi:10.1080/00461520.2016.1155457
24. Lahey J. The Gift of Failure: How the Best Parents Learn to Let Go so Their Children Can Succeed. Harper; 2015.
25. Edmondson AC. Strategies for Learning from Failure. Harvard Business Review 89, no 4. Published online April 2011.
26. Lin-Siegler X, Ahn JN, Chen J, Fang FFA, Luna-Lucero M. Even Einstein struggled: Effects of learning about great scientists' struggles on high school students' motivation to learn science. Journal of Educational Psychology. 2016;108(3):314-328. doi:10.1037/edu0000092
27. Woodcock C, Richards H, Mugford A. Quality Counts: Critical Features for Neophyte Professional Development. Sport Psychologist. 2008;22(4):491-506.
28. Cremades JG [Ed], Tashman LS [Ed]. Global Practices and Training in Applied Sport, Exercise, and Performance Psychology: A Case Study Approach.; 2016. http://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=psyc13&NEWS=N&AN=2016-22615-000
29. Wong SSH, Lim SWH. Prevention–Permission–Promotion: A Review of Approaches to Errors in Learning. Educational Psychologist. 2019;54(1):1-19. doi:10.1080/00461520.2018.1501693
30. Wang YB, Zhang W, Salvendy G. A Comparative Study of Two Hazard Handling Training Methods for Novice Drivers. Traffic Injury Prevention. 2010;11(5):483-491. doi:10.1080/15389588.2010.489242
31. Billett S. Errors and Learning from Errors at Work. In: Bauer J, Harteis C, eds. Human Fallibility: The Ambiguity of Errors for Work and Learning. Springer Netherlands; 2012:17-32. doi:10.1007/978-90-481-3941-5_2
32. Burlew CC. Surgical education: Lessons from parenthood. The American Journal of Surgery. 2017;214(6):983-992. doi:10.1016/j.amjsurg.2017.09.014
33. Klasen JM, Lingard LA. Allowing failure for educational purposes in postgraduate clinical training: A narrative review. Medical Teacher. Published online July 7, 2019:1-7. doi:10.1080/0142159X.2019.1630728
34. Charmaz K. Constructing Grounded Theory: A Practical Guide through Qualitative Analysis. Repr. Sage; 2012.
35. Charmaz K. Shifting the Grounds Constructivist Grounded Theory Methods. In: Morse J, Stern P, Corbin J, et al, Eds. Developing Grounded Theory: The Second Generation. Routledge; 2016.
36. Yardley S, Teunissen PW, Dornan T. Experiential learning: Transforming theory into practice. Medical Teacher. 2012;34(2):161-164. doi:10.3109/0142159X.2012.643264
37. Park N, ed. Qualitative evaluation and research methods. 2nd edn. Newbury Park, Calif: Sage Publications, 1990.
38. Hsieh HF, Shannon SE. Three Approaches to Qualitative Content Analysis. Qualitative Health Research. 2005;15(9):1277-1288. doi:10.1177/1049732305276687
39. Kilminster S, Cottrell D, Grant J, Jolly B. AMEE Guide No. 27: Effective educational and clinical supervision. Med Teach. 2007;29(1):2-19. doi:10.1080/01421590701210907
40. Ziv A, Ben-David S, Ziv M. Simulation Based Medical Education: an opportunity to learn from errors. Medical Teacher. 2005;27(3):193-199. doi:10.1080/01421590500126718
41. Gardner A, Rich M. Error management training and simulation education. Clin Teach. 2014;11(7):537-540. doi:10.1111/tct.12217
42. Shelton JD. The Harm of "First, Do No Harm." JAMA. 2000;284(21):2687. doi:10.1001/jama.284.21.2687

43. Wu AW, Busch IM. Patient safety: a new basic science for professional education. GMS Journal for Medical Education; 36(2):Doc21. Published online March 15, 2019. doi:10.3205/ZMA001229
44. Smith CM. Origin and Uses of Primum Non Nocere -Above All, Do No Harm! The Journal of Clinical Pharmacology. 2005;45(4):371-377. doi:10.1177/0091270004273680
45. Kennedy TJT, Lingard L, Baker GR, Kitchen L, Regehr G. Clinical Oversight: Conceptualizing the Relationship Between Supervision and Safety. Journal of General Internal Medicine. 2007;22(8):1080-1085. doi:10.1007/s11606-007-0179-3
46. Kennedy TJT, Regehr G, Baker GR, Lingard LA. Progressive independence in clinical training: a tradition worth defending? Academic medicine : journal of the Association of American Medical Colleges. 2005;80(10):106-111. doi:10.1097/00001888-200510001-00028
47. Singh H, Thomas EJ, Petersen LA, Studdert DM. Medical errors involving trainees: a study of closed malpractice claims from 5 insurers. Arch Intern Med. 2007;167(19):2030-2036. doi:10.1001/archinte.167.19.2030
48. Farnan JM, Johnson JK, Meltzer DO, et al. Strategies for Effective On-Call Supervision for Internal Medicine Residents: The Superb/Safety Model. Journal of Graduate Medical Education. 2010;2(1):46-52. doi:10.4300/JGME-D-09-00015.1
49. Farnan JM, Petty LA, Georgitis E, et al. A Systematic Review: The Effect of Clinical Supervision on Patient and Residency Education Outcomes. Academic Medicine. 2012;87(4):428-442. doi:10.1097/ACM.0b013e31824822cc
50. Czeisler, Blum, Shea, Landrigan, Leape. Implementing the 2009 Institute of Medicine recommendations on resident physician work hours, supervision, and safety. Nature and Science of Sleep. Published online June 2011:47. doi:10.2147/NSS.S19649
51. Kennedy TJT, Regehr G, Baker GR, Lingard LA. 'It's a cultural expectation…' The pressure on medical trainees to work independently in clinical practice. Medical Education. 2009;43(7):645-653. doi:10.1111/j.1365-2923.2009.03382.x
52. Gartmeier M, Bauer J, Gruber H, Heid H. Negative Knowledge: Understanding Professional Learning and Expertise. Vocations and Learning. 2008;1(2):87-103. doi:10.1007/s12186-008-9006-1
53. Minsky M. Negative expertise. International Journal of Expert Systems. 1994;(Volume 7 Issue 1):13-18.
54. Becker HS. Boys in White: Student Culture in Medical School. Transaction Books; 1977.
55. Samsudin EZ, Isahak M, Rampal S. The prevalence, risk factors and outcomes of workplace bullying among junior doctors: a systematic review. European Journal of Work and Organizational Psychology. Published online August 2018:1-19. doi:10.1080/1359432X.2018.1502171
56. Cottrell D, Kilminster S, Jolly B, Grant J. What is effective supervision and how does it happen? A critical incident study. Med Educ. 2002;36(11):1042-1049.
57. Kilminster SM, Jolly BC. Effective supervision in clinical practice settings: a literature review. Med Educ. 2000;34(10):827-840.
58. Frank E, Carrera JS, Stratton T, Bickel J, Nora LM. Experiences of belittlement and harassment and their correlates among medical students in the United States: longitudinal survey. BMJ. 2006;333(7570):682. doi:10.1136/bmj.38924.722037.7C
59. Rothenberger DA. Physician Burnout and Well-Being: A Systematic Review and Framework for Action. Diseases of the Colon & Rectum. 2017;60(6):567-576. doi:10.1097/DCR.0000000000000844
60. Lases SS, Slootweg IA, Pierik EGJM, Heineman E, Lombarts MJMH. Efforts, rewards and professional autonomy determine residents' experienced well-being. Advances in Health Sciences Education. 2018;23(5):977-993. doi:10.1007/s10459-018-9843-0
61. Musselman LJ, MacRae HM, Reznick RK, Lingard LA. "You learn better under the gun": intimidation and harassment in surgical education. Medical Education. 2005;39(9):926-934. doi:10.1111/j.1365-2929.2005.02247.x
62. Harteis C, Frost F. Error Orientation in the Context of Intuitive and Competent Behaviour: Results of an Exploratory Study in the Domain of Emergency Medicine. In: Bauer J, Harteis C, eds. Human Fallibility. Vol 6. Springer Netherlands; 2012:141-153. doi:10.1007/978-90-481-3941-5_9

Online supplementary file 1: Representative example of allowing failure: an experienced clinical supervisor reported allowing a resident to fail (twice) under direct supervision during two C-sections in two nightshifts.

My newest example, which I had just a few weeks ago on the night shift, was the night shift of a junior doctor in her third year. She's quite confident in what she's doing. I asked her if she wants to perform a C-section after full dilatation of the cervix, which can sometimes lead to a difficult extraction of the head. So, she said "yes, I'm confident I will manage it". I had a lot of different difficult deliveries, and I will manage, so I let her do. I saw that when she opened the uterus, or when she just had done the uterotomy, I saw that she is really going inside with a hand in a manner I couldn't imagine she can ever get the baby out, so I let her fail. She didn't get the baby out, and I had to overtake. Yes, afterwards, I asked her what she thought was her problem, but in the moment, I let her do, and I didn't interact just in the moment. … I think for her it was horrible because she was so self-confident that she thought she will manage, and nevertheless, I think she learned a lot in the moment she had to do it. The horrible thing is that the night afterwards, we had the same, the exact same situation once again, and she said "yes, yesterday it was horrible. I want to do it once again", and she did the things we talked about, but once again, something went wrong. I saw that she had no clue how the baby's position inside the body is, which is one of the most important steps. The time before she had a problem with her technique, and this time she had a problem with her perception of how the baby's position is. She failed again, and I think it was one of her strongest night shifts because then she suddenly recognized how life can be when your supervisor doesn't interact just in the moment, but just sorts the problem afterwards. For the second time, I saw that she managed what she did wrong for the first time, but I saw that it would be very, very rare that she will manage to get the baby out the way she tried to do so. I thought yes, but as last night, she told me, yes, now she got it, what's her problem? I thought about, okay, let's do her a favor and let her absolutely fail, and then perhaps she will get it. And so it was also about 20 seconds or something, and then I also overtook because she didn't manage because with the failure in the process of getting the baby out, you cannot get the baby out unless it's very small or the kind of baby who helps by itself. So, I let her fail, and I asked her, just when we got out of the Operation Theatre, what she thinks happened this time, yeah. … I said to her we should take some minutes to discuss the moment, and she should get the model of the pelvis, of the female pelvis, and the baby to see what she thinks how the baby was positioned and what the problem was. (P7)

Online supplementary file 2: Samples of allowing failure, categorized in clinical performance types (Quotes)

Operation, technical procedure: If I have a young patient and he has appendicitis and we do the appendectomy and I see he will now just cut the artery, he didn't coagulate enough very probably, but it's not a 5-year-old child but, I don't know, 18 and he can tolerate 150 ml of blood loss and cleaning the camera and everything. I would probably retract the camera a little bit so hopefully it doesn't get all bloody, but if it's not the first where I would have to say, you have to coagulate more, I would probably let this happen to have that, ahh this was not enough. (P5)

For example, when you see a small vessel, and you know, okay, he or she will cut it soon, but you don't say anything because you know, well, it's going to be okay. We can stop the bleeding. It's not too dangerous, but then you wait and see, and you let them do it. (P2)

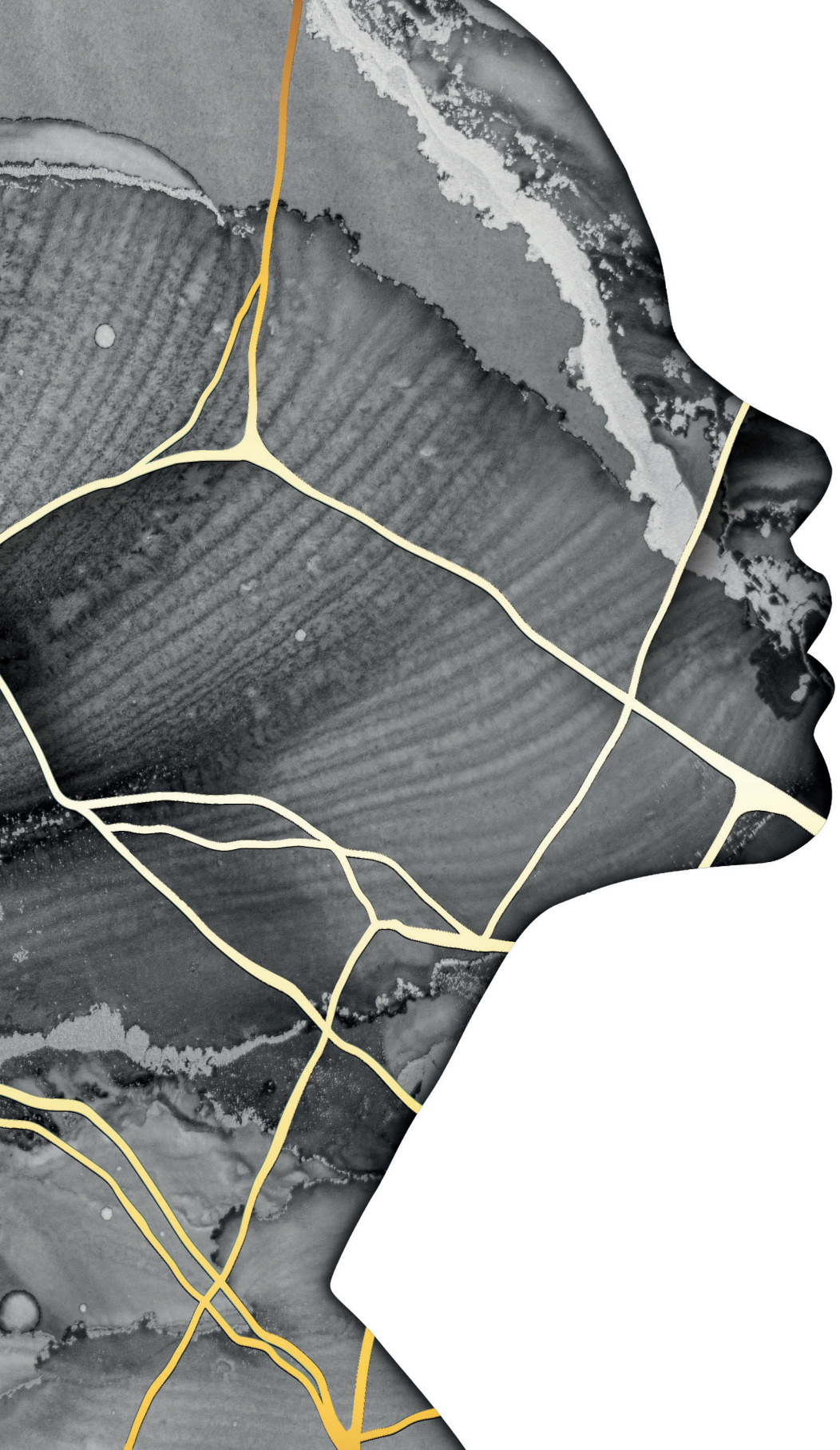
Medication: You know, sometimes I'll let them give a smaller dose of a drug, like the potassium I think is a good example, and I'll say, okay, I would give three doses three hours apart and then I'd recheck the electrolytes. And they're feeling like, oh, no, I've already ordered these smaller doses. I said, okay, fine, you're going to recheck the electrolytes anyway and then you'll see, but after that, you'll see, you'll end up giving another two doses. (P18)

Communication: Or in a clinical situation, sometimes when I observe how they are questioning a patient and sometimes I notice they are not on the right way with their questions to get to the problem, then of course I would let them ask a couple more questions, maybe he finds the right way again… (P1)

Diagnostic procedures: Or another example, if you do an ultrasound which is in the beginning it's quite hard. It's not easy to do an ultrasound, in the beginning everything looks the same. And when they have looked at the liver and there are hemangiomas which are quite often and if the resident doesn't see the hemangioma it's a mistake, but I tell him after the examination is over because it's not important for the patient because hemangiomas are not dangerous. If I see something in the liver, which the resident doesn't see and it looks a metastasis or whatever, something else, of course I tell the resident again to have a look at the liver again. (P19)

Decision-making: But, often, or sometimes, of course, I have the situation that the resident discusses everything (diagnostic or treatment plan) with the patient and at the end of the day, I tell him, so tell me what you have seen and we can discuss the cases. Then, sometimes I let go the plan they did. Also, I think it's maybe not the best, but they do not harm. (P6)

Patient management and organization: You often let them do mistakes, but it's always the same. When we are on the ward, when you do your rounds, and then you see, well, he doesn't realize a situation, for example, then sometimes you don't say anything, and you think, okay, he will see. He will see that this stomach is not good, for example, or that the patient hasn't enough algetic or something like that so you can wait for a while, but often you want to look if they realize it themselves. But, of course, it's the same there so you don't want to let the patient suffer too much. (P2)



4

“It depends”: The complexity of allowing residents to fail from the perspective of clinical supervisors

Published as
Klasen JM, Teunissen PW, Driessen EW, Lingard LA.
‘It depends’: The complexity of allowing residents to fail from the perspective of clinical supervisors.
Med Teach. 2022 Feb;44(2):196-205.

Abstract

Purpose: Clinical supervisors acknowledge that they sometimes allow trainees to fail for educational purposes. What remains unknown is how supervisors decide whether to allow failure in a specific instance. Given the high stakes nature of these decisions, such knowledge is necessary to inform conversations about this educationally powerful and clinically delicate phenomenon.

Materials and methods: 19 supervisors participated in semi-structured interviews to explore how they view their decision to allow failure in clinical training. Following constructivist grounded theory methodology, the iteratively collected data and analysis were informed by theoretical sampling.

Results: Recalling instances when they considered allowing residents to fail for educational purposes, supervisors characterized these as intuitive, in-the-moment decisions. In their post-hoc reflections, they could articulate four factors that they believed influenced these decisions: patient, supervisor, trainee, and environmental factors. While patient factors were reported as primary, the factors appear to interact in dynamic and nonlinear ways, such that supervisory decisions about allowing failure may not be predictable from one situation to the next.

Conclusions: Clinical supervisors make many decisions in the moment, and allowing resident failure appears to be one of them. Upon reflection, supervisors understand their decisions to be shaped by recurring factors in the clinical training environment. The complex interplay among these factors renders predicting such decisions difficult, if not impossible. However, having a language for these dynamic factors can support clinical educators to have meaningful discussions about this high-stakes educational strategy.

Introduction

Clinical supervisors are trusted with challenges such as providing learning opportunities, instructing, giving feedback to support trainees and nudging them to the edge of their clinical competence so that they develop.[1–10] On a daily basis, supervisors have to engage in decisions on how to allow trainees to strive and develop their skills.[3,4,11] This will depend on different factors and some of the complexities of these decisions have been studied in the medical education literature on clinical supervision.[10,12–15] Part of the challenge is that supervisors will find themselves in situations where they know or sense that the trainee working at the edge of their competence might fail in ways that potentially impact patient care.[16–18] In some instances, such failures can offer powerful learning experiences, but they confront supervisors with an apparent trade-off between trainee learning and patient safety.[19–27] Although, we know how supervisors navigate trust and entrustment decisions to grant autonomy at a designated level of supervision,[13–15,28–35] we know little about how supervisors decide what to do in situations where they could allow failure for educational purposes.[21,36,37]

Our recent interview study found that clinical supervisors from a variety of postgraduate specialty contexts reported allowing failure for educational purposes.[21] Supervisors reported allowing a variety of erroneous actions in different clinical settings so that trainees could learn by failing and recovering from it. Supervisors expected both technical and emotional benefits from these allowed failures for trainees, while they endeavored to limit the consequences for patients. The first content analysis of these reported failures sets the stage to understand the concept of allowing failure and has yielded a preliminary definition of the phenomenon: "While supervising a trainee's clinical performance, the supervisor detects an imminent trainee mistake, has the opportunity to intervene but deliberately chooses not to do so because the educational gain for the trainee is perceived to outweigh the (potential) consequences for the patient".[21] This definition provides a useful starting point for conversations about the educational practice of allowing failure. However, such conversations must also be informed by insights into how this educational practice is enacted. It is this gap that the current paper addresses, by exploring the question: what is the judgment process that supervisors employ to decide whether or not to allow trainee failure during a clinical performance? The exploration of how supervisors decide to allow failure in one situation but not another will allow us to refine the preliminary definition of this phenomenon, develop a shared vocabulary for discussing it in our medical education community, and provide a framework for

faculty development efforts to prepare clinical faculty for these high-stakes supervisory decisions.

Methods

Research design

We used constructivist grounded theory (CGT) to explore the complex social process of supervisors allowing failure in the clinical workplace.[38,39] With approval by Swiss (EKOS) and Canadian institutional research Ethics, we chose to conduct individual interviews voluntarily, calculating that participants would feel comfortable speaking candidly with a colleague (JK). The data collection and analysis were iterative, and we, as constructivist researchers, acknowledge that our interpretation of both was shaped by our experiences, which we shared and discussed in regular meetings.

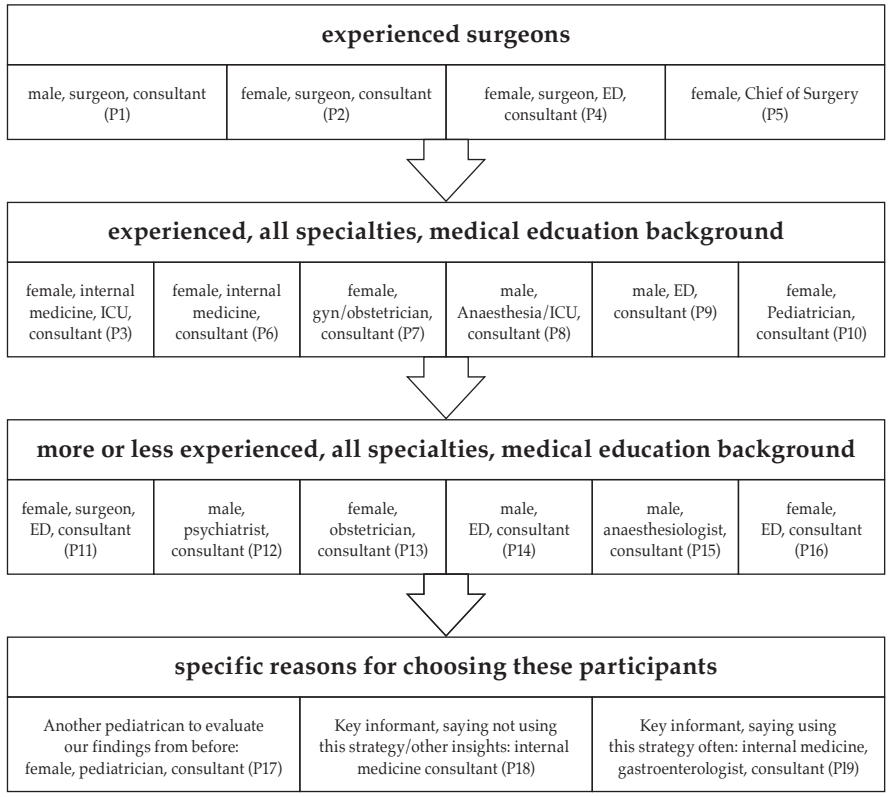
We proposed the term "allowing failure for educational purposes" as a consistent starting point for our research program. We chose the term 'failure' for two reasons: first, the definition of failure as "lack of success in doing something,"[40] matches better with our context of clinical learning than the definition of 'error'; "to make a mistake or to do something wrong".[41] Second, as educational scholars, we adapted this term from other domains of education, where authors have used 'failure' rather than 'error' if educational benefits can thus be obtained.[42–48] We aim to develop a common language in the literature of medical education that can build on discussions of learning from failure in other educational contexts.

Sampling strategies, settings and data collection

All study participants held a faculty position in a hospital and identified themselves as clinical supervisors, with varying stages of experience. We recruited participants in Switzerland and Canada from a range of clinical specialties.[21] (Figure 1) We tried to purposely select our sample to secure information-rich participants who are interested in the study question and showed willingness to participate after hearing about our study topic.[49] We acknowledge that such participants have a subjective position; they are not representative and not unbiased. We still conducted interviews with a range of different reflections of participants. Also, we had two discrepant examples in the dataset, which might show that not only supervisors participated who use this teaching strategy. Having an interviewer (JK) from the surgical field, surgical supervisors in senior faculty positions were interviewed at the beginning of the study (P1, P2, P4, P5) as a rapport building strategy. (Figure 1) We expanded the interview process from surgical supervisors with experiences as clinicians and supervisors to other specialties and colleagues with medical education background, formal training such as a master's or Ph.D. degree, or medical education research (P3, P6, P7, P8, P9, P10). We expected them to be informed about clinical supervision concepts and be able to reflect in-depth on different supervisory strategies. Further, we included less experienced supervisors from all specialties with medical education background (P11-P16). We chose the last three interview candidates for specific reasons: P17 was recommended by a colleague interested in the study topic, working as a pediatrician. P18 presented an informal conversation before the interview as a discrepant case, saying not using the strategy of allowing failure rather than the last interview participant, who confirmed the dataset in perceiving to use this strategy (P19) regularly.

Including participants from two different sites had the intention to broaden our perspective on trust as it may relate to institutional culture, while both sites were conveniently chosen due to the research team settlement. Seventeen interviews were conducted in English with native and non-native speakers, while two were conducted in German for the participants' convenience and translated professionally afterwards. The semi-structured, individual interviews, conducted by JK, lasted between 45 and 75 min. All interviews were audio-recorded and subsequently transcribed verbatim. We explored participants' perceptions of learning from failure in general and allowing trainee failure in the clinical workplace. Initially, we used an 'easing-in' strategy, in case the idea of allowing failure might be perceived by participants as a sensitive topic. This strategy involved beginning the interview with a broad question about whether they had ever seen a trainee fail in clinical situations and whether they had anticipated that such a mistake might occur, and afterwards inquiring about the strategy of allowing trainees to fail for learning purposes. Because our first 4 participants did not exhibit inhibitions about discussing the strategy of allowing failure, we dropped this "easing-in strategy" in later interviews in order to maximize the interview time. These interviews began with a brief introduction to the strategy of allowing failure in other educational settings and then asked about whether and how clinical supervisors use this strategy in clinical training. After 19 interviews of clinical supervisors, we perceived to reach the point of theoretical sufficiency, where no new codes or themes occurred.[50]

Figure 1. Step-by-step sampling strategy.



Data analysis and Research team

In accordance with constructivist grounded theory (CGT), we collected and analyzed the data iteratively during a process of constant comparison of the data, refining the interview protocol and engaging in theoretical sampling to explore recurrent categories.[51] Two kinds of analysis were conducted. During the analysis of the CGT data, we realized a richness in the narratives and decided to do a second qualitative content analysis of each reported instance of an allowed failure in the data which yielded a description of the key features of this educational phenomenon and a first definition of the phenomenon in a previously published paper.[21]

The constructivist grounded theory analysis reported in this paper differs from the already published content analysis in two main ways. First, it aims to explain how supervisors perceive making the decision to allow failure for educational purposes, and second, we used a different methodology (CGT) compared to the previously published one to answer our research questions.[21] Also, by providing two different research questions – how the phenomenon of allowing failure presents itself in the data and how supervisors decide to allow failure in different clinical situations, we used two distinct different analysis techniques to cover two different problems. As a first step in this analysis and following CGT procedures, we grouped related topics and defined these using gerunds, such as assessing and decision making, taking a risk, or calculating patient safety. We refined these recurring categories using the constant comparative method, in which new instances of a theme were compared to all existing instances, and the definition of each theme revised until it accounted for all dimensions of all instances.[51] We used Quirkos as a qualitative software to support the analysis.

The international team consisted of three PhD-trained medical education researchers (LL, PWT, ED) and one PhD candidate (JK). JK and PWT are clinical supervisors in abdominal surgery and in obstetrics and gynecology, respectively. JK's surgical experience and interest shaped the direction of the results, and the sampling of the participants from surgical disciplines in being able to share experiences and rapport, especially in exploring trainees' failures during surgical procedures.

Results

Twelve women and seven men from 11 different Swiss and Canadian institutions were interviewed. The participants' expertise as clinical supervisors ranged from 2.5 years to over 25 years. Thirteen of the 19 participants worked in non-surgical environments such as emergency medicine, critical care, internal medicine or subspecialties, pediatrics, and psychiatry. The surgical specialties were represented by general surgeons and obstetricians/gynecologists. Participants explained that they understood the decision to allow failure as an in-the-moment, intuitive phenomenon. We identified four main factors that they perceived as important influences on the decision to allow failure: patient-, trainee-, supervisor-, and environment factors. Supervisors portrayed these factors as interacting with one another and producing variability in their decisions.

Intuitive decisions

Although they often made the intuitive decision to allow failure in clinical situations, many participants declared that the interviews were the first time they had reflected about it outside the moment of allowing failure itself. The decision to allow trainees to fail was characterized as largely unconscious:

"I think I consciously don't do it [allowing failure] very often, but I think I unconsciously perhaps may be doing it more than I think" and "I'm probably unconsciously allowing for it to happen without calling it that" (P12). As an emergency clinician reflected: "And now, I am doing this interview, I really think of it. … I was forced to think consciously about things I'm doing unconsciously in my daily life, so it's very interesting." (P16) In addition to characterizing the process as unconscious, participants also described it as intuitive, "a point-to-point decision" (P9) arising "in the moment" (P7). One supervisor described "it was such a snap decision, too, it wasn't something that I hemmed and hawed over." (P13) Even as they characterized the decision to allow failure as unconscious and in-the-moment, supervisors tried to describe what these moments were like. In the interviews, we invited supervisors to reflect on these in-the-moment decision that they described as intuitive decisions. Some had already given this some consideration while others articulated their approach to such situations for the first time during the interview. Below, we illustrate how they tried to illuminate this decision, rationalizing feelings and different factors that they made explicit in the reflections during the interview.

Most interviews cited the role of "feelings": "The line between taking the risk (to allow failure) and taking over from the resident to make sure there is no further damage, or no damage at all, is only a feeling. This is very difficult to describe." (P09) And every interview also presented logical explanations of factors that were weighed: "But like the judgment if we don't want to talk about the environment, about the resident again, it's the patient as well. Like all these factors together it's like … I think it's a mixture of feelings and facts." (P11) Another consultant confirmed:

> Yes, it's always feeling. It's always a combination. As I said before, a combination of the case, whether it's a stable situation, of the experience, whether you've experienced the same or a comparable situation before so it's always feeling which makes the decision. (P19)

Supervisors talked about their 'gut feeling' or 'intuition' being an important aspect of their decision to allow a failure for educational purposes. Describing this aspect of their decision-making, they acknowledged that "It's not very scientific" (P2) and sometimes "rather a feeling than a really conscious calculation" (P9), confirmed by another ER physician: "I don't think I can calculate that, actually. I never consciously calculate before I do something." (P16) Even the issue of potential risk for patients was described in this way:

"The line between taking the risk and taking over from the resident to make sure there is no further damage, or no damage at all, is only a feeling." (P8)

As participants reflected on these in the moment decisions, they became more analytical.

In the next section, we illustrate in more detail the main factors that supervisors described weighing logically in deciding whether or not to allow failure.

Four main factors

Across all accounts of the decision to allow failure, four factors recurred consistently: patient, trainee, supervisor, and environment factors.

First, participants presented *patient factors* as the most important and predominant factor. Regardless of other factors, participants stated they would not allow failure if it posed unacceptable risk to the patient: "I try to dose my interference with the severity of the sickness of the patients, but I think I never did, I just try to think when I saw, for example, in the resuscitation room, where they come in when they're really sick, I never let them do it by themselves." (P3) Some supervisors declared other patient factors to consider if the patient was elderly, undergoing cancer treatment, or pediatric: "If you have a young one, a very fragile person, for example, a child, of course, you don't tolerate anything, so I think it depends. I think you really look at your patients and think, well, here I have to be more careful, and you have to say more here." (P2) or another consultant put it this way, drawing an example of an emergency colonoscopy:

> … Yes, as long as I see that the patient is stable. If the patient develops a tachycardia or a hypotension, of course I would not let the resident continue with the whole endoscopy. Then I would have to finish it but as long as a patient is stable it's okay. (P19)

Second, *trainee factors* were perceived as another main component influencing supervisors' decisions about allowing failure. The personality of young physicians was reported by many supervisors as a factor in their decisions. Confidence, both too much and too little, was recurrently discussed as part of what supervisors considered in relation to "personality". As one surgeon stated: "if I had the feeling that the person is generally reasonable, then I would be way more open than if I have the impression the person is just Rambo and it's dangerous." (P5)

As this quote illustrates, for this supervisor, an overconfident trainee would not be allowed to fail, while a trainee with 'reasonable' levels of confidence might be.

Knowledge of and comfort with trainees arose through the supervisor-trainee trusting relationship. Not uncommonly supervisors remarked that "you need to have a certain relationship" (P1) to allow failure, explicitly connecting this to the idea of "a foundation of trust" (P4) that must exist. As one participant explained, trainees "… have to trust me. They have to think that I'm professional and that I don't judge them when they fail. I think this is the most important thing, that they're not afraid of me." (P2) Such reflections suggest the relationship of trust might make supervisors more likely to allow failure. In the absence of such a relationship or with trainees they perceive as being afraid of them, they may be less likely to allow failure. Another participant explained how their knowledge of a trainee as "a very careful person" or "a bull in a china shop" (P1) informs their decision to allow failure.

Third, when considering allowing failure, participants also reflected on *supervisor factors* such as abilities and constraints. Many participants talked about their own comfort and confidence as a factor in their decision. As one supervisor stated: "I think it's important that there be comfort with uncertainty, and you have to be of a predisposition that you don't need to have control over everything in order to allow failure to be part of how you teach." (P12) All participants agreed that, in order to even contemplate allowing failure, supervisors need to "… be comfortable with the situation and the procedure and the problem itself" (P16). The data offer a striking range of examples where comfort level and confidence dictated the decision about allowing failure. For instance, one surgical supervisor acknowledged that she/he wouldn't tell the resident "just cut it [the exposed anatomical structure] … if it's really you knew it was the vena porta, then I maybe can't fix it. And then it's game over for all of us" (P1), while another commented that "if this mistake happens, I will be able to handle this afterwards" (P2), and a third reflected "do I put them in situations where it's not unsafe for them to potentially fail? Yes, I give them those opportunities, that, for sure, but knowing that I can bail them out, I can back them up, I can make that work" (P18). While a general level of comfort and confidence was important, the decision to allow learner failure was also influenced by the supervisor's sense of their own current personal conditions. As this surgeon explained, "sometimes, you want to risk more [so] that your student can learn, and on the other hand, you have days that you think, 'oh no, I have my own problems, so I don't want to add more'." (P2) Fatigue was one such issue: as another supervisor explained,

"when you sleep three or four hours, you just don't have the nerves to go through this whole process" (P3) of allowing failure and attending to its technical and emotional consequences.

Last, in reflecting on such situations, participants noted how *environmental factors* influence their approach. For instance, in a case of an emergency endoscopy, the supervisor described how environmental factors such as having experienced nurses and sufficient time for the procedure can influence their decision:

> For example, once it is not like doing a mistake but in bleeding situations for example there are different methods to stop the bleeding. And sometimes I would prefer the one method and the resident for example would prefer another method, of which I am pretty sure it won't work but of course I let the resident try it, try to stop the bleeding. Most of it doesn't work and in such a situation I would prefer to have assistant endoscopy nurses who are experienced for example because the others might become very nervous because it's still bleeding. And then the whole situation would become nervous and that's not good, so experienced other staff of the ward and enough time. P19

Supervisors reported not to feel comfortable to allow failure in busy environments: "When it's a stressful day, when I'm in a time rush or whatever, where there's time pressure, I'm not comfortable to do that kind of teaching method." (P16) The lack of cognitive and emotional space in a busy environment was also a factor in dealing with the aftermath of being allowed to fail. Given their sense that "it's me who has to afterwards clean up the mess again" (P3), supervisors wanted to know that the environment would allow for both this. They also recognized that "the time to debrief" (P7) with the trainee was essential to "make this a productive failure situation". (P3)

"It depends": Interactions among the Factors

The four main factors – patient, trainee, supervisor, environment – were not discrete; they interacted in a complex interplay to produce decisions about allowing failure. One ER physicians reflected on potential reasons, rationalizing:

> If there is a patient who is really annoyed and in pain and anxious and whatever then I wouldn't do it because it would make the situation just worse. If it's a child where you have really annoying or anxious parents, you wouldn't do it. If it's a patient who is patient [tolerant], then you can do it.

> Yeah, it depends on many things. But like the judgment if we don't want to talk about the environment, about the resident again, it's the patient as well. Like all these factors together … (P11)

In another elaborate example, these interactions were evident as participants reflected on how they approached particular situations. One obstetrician reported a representative scenario during a laparoscopic procedure "where things had been kind of challenging throughout the case." (P13) In trying to explain her "snap decision" (P13), she began with her sense of how trainee factors and the supervisory-trainee relationship fed into the decision:

> I felt like he and I already have a pre-existing relationship and I know that he's capable. I also think that he feels I don't let him do enough, that I don't give him enough autonomy, so this seemed like a good opportunity to do so. … At one point, he asked me, well, how do you want to do this next step? And, I said, well, this is your case, so how would you like to do it? He made a suggestion and that's when I thought his suggestion is a) not a way I've ever seen it done before and b) I can think of how that would go wrong. But, I said to him, okay, you have one chance. You get one try your way and if it doesn't work, we're doing it my way. (P13)

Layered on top of these trainee factors and supervisory relationship factors, however, she also perceived that their own state of "being exhausted" factored into their decision, in this example articulated as:

> My guard was let down. …. I wonder if I was just so exhausted with having worried throughout this entire procedure that things were not going smoothly, that I kind of gave up. (P13)

Her recollection was further elaborated by their sense that environmental factors also played a role because

> … It was also the middle of the night, in the midst of a very busy call shift, where your brain is already thinking about 100 different other things, like, am I going to have to [perform a caesarean] section [on] that lady upstairs, will I have to do forceps for that woman, I hope the tracing has gotten better in that other room. (P13)

This multi-layered explanation is representative of how participants reflected at length on the various, intersecting factors that shaped their 'snap decisions'. However, there was no recurrent pattern discernable in such explanations regarding how the factors intersected, and, consequently, there was no strong sense of predictability from one decision-making instance to the next. Instead, our analysis suggests that the interplay of factors is dynamic and nonlinear, and whether a supervisor decides to allow failure or not "depends on many things" (p11). The one exception was that supervisors consistently declared that the patient factor trumped the others, like the surgeon who said: "it's always, yeah, it depends how dangerous it is for the patient" (P2) or the ER physician who explained: "If it's a child where you have really annoying or anxious parents, you won't do it." (P11)

Such detailed reflections suggest that supervisors are considering multiple factors, they are doing so in the moment, and the process is at least partly an intuitive one.

Discussion

This work provides insights into how clinical supervisors understand, after the fact and in what many acknowledged as their first conscious reflection on the process, their intuitive, in-the-moment, and sometimes high-stakes decisions to allow trainee failure. Clinical supervisors may find our results familiar, while the results of this study provide evidence of this phenomenon. Supervisory decisions about allowing failure for educational purposes share a number of characteristics: they weigh different factors in-the-moment, prioritize the patient, based on intuition. However, our results suggest key factors that influence these decisions, but the relationship among them is unstable, characterized by a recurring refrain of "it depends" in the data. Below we wrestle with this central finding and consider its implications for patients, supervisors and learners.

In conducting a CGT analysis, we set out to develop a model of how supervisors decide to allow trainee failure, with the hope that such a model might be used to inform, critique or even predict such supervisory decisions. However, while the four factors provide insight into how supervisors understand the risks and benefits of allowing failure for learning, they do not provide a model for understanding why failure might be allowed in one situation but not another. Supervisors' accounts demonstrated that, even when the factors appeared

similar (e.g., a strong trainee, a trusting supervisory relationship, a stable patient, a familiar team), in one case a supervisor might allow failure and in another avert it. It just depends. And it depends on a set of factors that exist in dynamic, non-linear relation to one another. A factor such as an over-confident trainee, or the risk of patient bleeding, or an unfamiliar team member may get heavily weighted in one decision, but not the next.

Our data aren't the first to point to the complexity and non-linearity of supervisory judgement and decision-making in clinical settings. Holzhausen et al. described four factors influencing supervisors' entrustment decision-making – trainee characteristics, supervisor characteristics, characteristics of the task at hand and contextual factors[15] – which resonate with those that we found in our study. They also acknowledged the complex interplay among these factors and the incomplete nature of their framework. Hauer et al. also explored the complexity of supervisory decisions in developing trust in their trainees while simultaneously caring for patients. A trusted supervisor-trainee relationship is influenced by different factors of the supervisor, trainee, the supervisor-trainee relationship, task, and context, suggesting a similar non-linearity of supervisory decision-making.[14]

The intuitive nature of these decisions undoubtedly contributes to the non-linear, "it depends" pattern of our results. What our participants describe as 'gut feeling,' drawing on intuition, resonates with the concept of implicit knowledge, composed of knowledge and practical experience acquired over several years, which is known to shape decisions and allow a quick reaction to a challenging situation.[52]

Intuition is a complex construct, variously treated across different literatures but largely embraced as a necessary part of expert decision-making and recognized as a source of potential wisdom in the unconscious mind.[53–59] Acknowledged as an essential feature of Type 1 reasoning in dual process theory, intuition is embraced as a necessary part of expert decision making and recognized as a source of potential wisdom in the unconscious mind.[52] However, it is, as Kahneman and Klein put it, "sometimes marvelous and sometimes flawed".[60] Marvelous in that clinical supervisors are continuously recognizing and weighing multiple factors as they move through the day. But flawed in that they cannot afford everything equal attention, and they may not know why some factors influence them more than others. Here, it makes sense here to see analogies to clinical or surgical decision-making. Physicians use the so-called System 1 thinking in recognizing patterns as rapid and intuitive decisions and System 2 thinking for analytical rationalizations of more complex situations.[52,61–63] Our participants represent their decisions as intuitive, even unconscious, which suggests that we are dealing with a non-analytical phenomenon. And while interview data can offer insights into how supervisors may rationalize their decisions after the fact, we must take care not to assume that these data represent an analytical process in the moment. Therefore, in an effort to avoid the linear assumptions of most process models, we do not present a model of the four factors.[64,65] Instead, we offer a refinement of our preliminary definition of this educational phenomenon.[21] Italics signify added terms, while square brackets signify terms we have removed in this version: "While supervising a trainee's clinical performance, the supervisor, *influenced by both intuition and a non-linear interplay of different factors*, detects an imminent trainee mistake, has the opportunity to intervene but [deliberately] chooses not to do so, because the educational gain for the trainee is perceived to outweigh the (potential) consequences for the patient." This definition includes the non-linear relationship of the four factors and the issue of intuition derived from this analysis; this definition also removes "deliberately" because our data calls into question how often this decision is conscious and deliberate. Our refined understanding of the phenomenon of allowing failure for educational purposes has implications for patient safety, clinical supervision, and trainee learning.

Non-linear, "it depends" decisions about allowing failure have implications for patient safety. Supervisors recognize that there is potential and uncertain impact on patient safety and, but they argue they would never allow it if they think it might harm a patient.[21] To take a critical standpoint on supervisors' analytical reflections on their decisions, of course they must assert that they won't let patients be harmed. If we take at face value their assertion that 'patient factors trump all', we cannot understand the nuanced reasoning they exert to judge degrees of acceptable harm in particular instances. In effect, our results show poignantly how supervisors' reason their way through the conundrum that keeping patients unaffected by trainee learning is a noble, necessary but ultimately unachievable goal. There is always a relationship between trainee development and patient risk, but it is complex one. For example, supervisors must consider not only the risk to today's patient, but also the risk to tomorrows. We might argue, a supervisory approach that absolutely safeguards today's patient increases the risk for future patients if the trainee hasn't been given the necessary autonomy to develop independence, while the relationship of both, trainees autonomy and patient safety is unknown but most likely nonlinear.[37,66] Thus, supervisors must constantly monitor not only the risk to the patient in front of them, but the hypothetical future risk associated with not allowing trainees to struggle, to fail and to learn.

As this suggests, non-linear, it-depends decisions about allowing failure also have implications for clinical supervision. Supervisors may struggle to make sense of their own decisions or, more problematically, may oversimplify them in post-hoc reflections. As Gilchrist et al. have recently shown in their analysis of 10 supervisory dyads, trainee behavior is not a straightforward 'trigger' for a faculty supervisory response [10]. Rather, "what appears to be a linear path towards an entrustment decision, may actually represent a complex interaction of factors".[10] Similarly, Hauer et al.'s study of how supervisors develop trust concludes that the process is a "dynamically evolving" and "sometimes nebulous" one,[14] and that supervisory entrustments "involve a synthetic, holistic judgement that perhaps cannot be fragmented into milestones".[14] What are clinical supervisors to do with the knowledge that their decisions are complex and perhaps even ill-suited to the supervisory tools they're asked to use, like milestones and entrustment scales? First, we contend that supervisors need a language for talking about these nuances. That language likely can't be the linear language of the entrustment and assessment literature;[12,31,34,67,68] we worry that it may stifle rather than support such conversations. We encourage supervisors and postgraduate programs to use the four factors as a preliminary vocabulary for describing, justifying and debating their supervisory decisions about allowing failure for learning. The development of a language for these dynamic factors can support clinical educators to have meaningful discussions about this high-stakes educational strategy and provide a framework for faculty development efforts to prepare clinical faculty for these high-stakes supervisory decisions, while in avoiding it to translate it immediately in scales and checklists.

We suggest that supervisors engage in a regular practice of reflecting on how different factors shape supervisory decisions on a regular basis, and focusing explicitly on recognizing variability and non-linearity by asking themselves, 'Why does today's decision differ from yesterday's'? We anticipate that such individual reflections and community discussions may also make more evident the role of intuition in these decisions and offer opportunities to reflect on its positive and problematic aspects by framing questions such as, 'When does intuition work, and when does it let us down?'

Last, there are implications for learners. If we view allowing failure as social interaction, intimately connected to the relationship between supervisor and trainee with a potential for a shared responsibility for such failures, then the nonlinear, it-depends nature of this phenomenon may be uncomfortable or confusing for trainees. If trainees are trying to gradually become more autonomous, they may experience a sense of randomness: sometimes I'm given

autonomy, sometimes not. Sometimes that autonomy leads to failure, sometimes not.[66,69–72] And while our participants agreed that the goal of allowing failure was to benefit trainee learning, the literature does not provide much evidence yet of this outcome. What do trainees learn from being allowed to fail? Beyond the educational impact, we also need to know the impact on trainee resilience and wellbeing of experiencing what may constitute sentinel emotional events.[73,74] We are currently engaged in research with trainees to explore their experiences of the educational strategy of allowing failure, including its impact on their learning, their well-being and their supervisory relationships.

Limitations

Choosing interviews might be seen as one of the limitations in revealing how supervisory decisions are made, especially if they are made navigated by intuition, limiting the insights individuals have into their cognitive processes afterwards.[55] Based on our sampling strategy, we chose to recruit participants from different specialties from two sides, which might be problematic when defining failure and allowing it in a specific contextual background. What may be judged as a failure in one specialty (surgical vs. non-surgical) may not be judged as such in another. However, surgical supervisors are slightly over-represented. On the one hand, this may be because the author and interviewer is a surgeon herself.[75] On the other hand, instances of failure are more recognizable in the context of invasive procedures, and the surgical decision-making process may be easier to describe. Furthermore, what for one supervisor is a failure, another calls a mistake, and yet another defines it as an everyday learning process within and outside the zone of proximal development. This shows how relevant the use of language in the exploration of such phenomena is. Interviewing non-native speakers of English by a non-native speaker may also represent a shortcoming of the study regarding finding a common language to describe such phenomena.[76,77]

Conclusions

Clinical supervision requires balancing the demands of patient safety and trainee learning. A key part of this balance involves decisions about when and whether it is safe to allow a trainee to struggle and perhaps fail during a clinical situation. These decisions may be largely intuitive, and they appear to be dynamic and nonlinear. While some situations clearly dictate that the supervisor

intervene to protect patient safety over training learning, in many other situations the decision is variable and dependent on the interplay among different factors. We suggest that these supervisory decisions should be the focus of faculty development in clinical training programs so that we can develop more explicit, shared thresholds for safely allowing trainee failure in the service of learning.

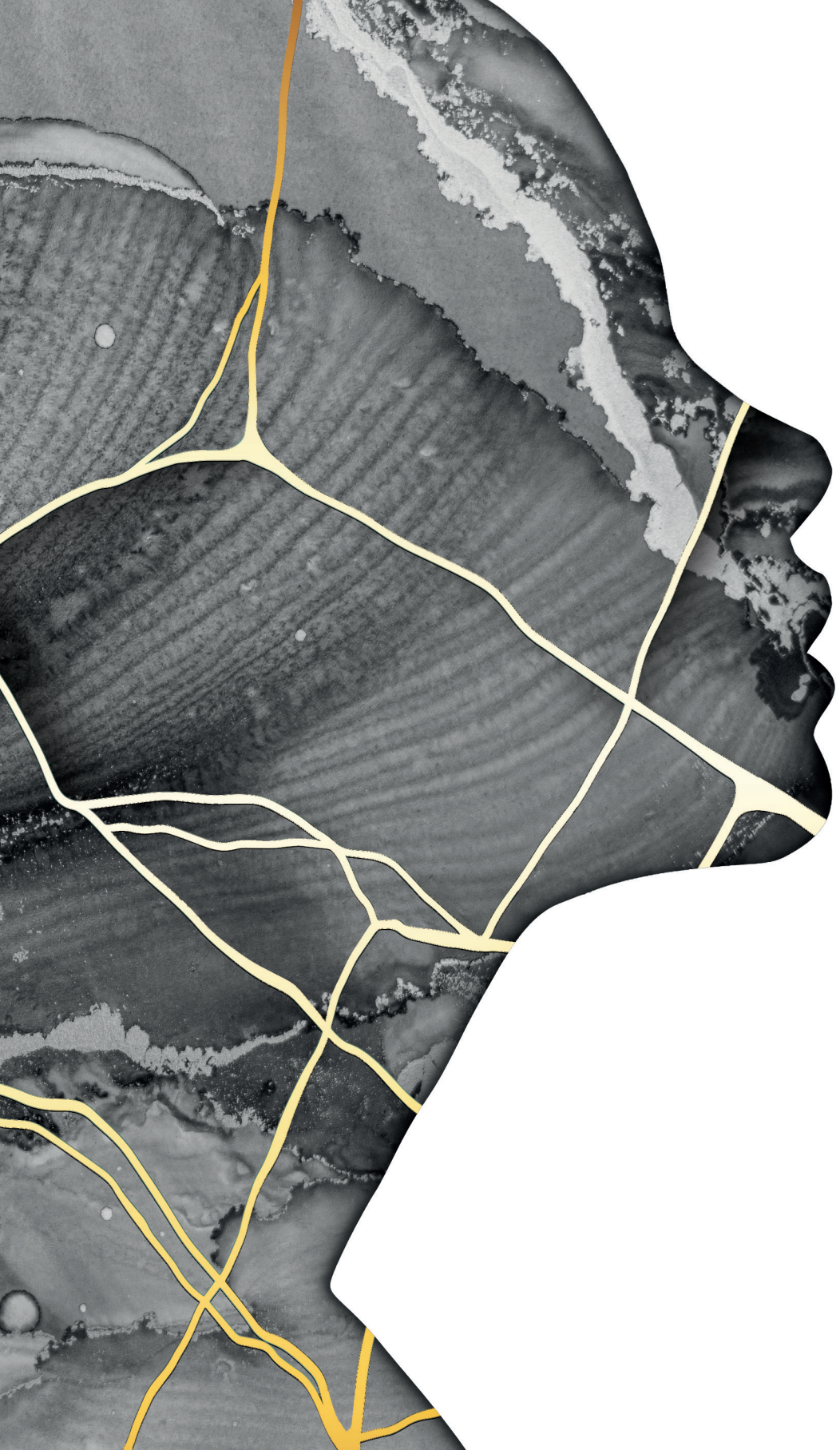
References

1. Farnan JM, Petty LA, Georgitis E, et al. A Systematic Review: The Effect of Clinical Supervision on Patient and Residency Education Outcomes. *Academic Medicine*. 2012;87(4):428-442. doi:10.1097/ACM.0b013e31824822cc
2. Farnan JM, Johnson JK, Meltzer DO, et al. Strategies for Effective On-Call Supervision for Internal Medicine Residents: The Superb/Safety Model. *Journal of Graduate Medical Education*. 2010;2(1):46-52. doi:10.4300/JGME-D-09-00015.1
3. Kilminster S, Cottrell D, Grant J, Jolly B. *AMEE Guide No. 27: Effective Educational and Clinical Supervision*. Vol 29.; 2007. doi:10.1080/01421590701210907
4. Kilminster SM, Jolly BC. Effective supervision in clinical practice settings: a literature review. *Med Educ*. 2000;34(10):827-840.
5. Walton M, Barraclough B. Clinical supervisors: are they the key to making care safer? *BMJ quality & safety*. 2013;22(8):609-612. doi:10.1136/bmjqs-2012-001637
6. Martin P, Kumar S, Lizarondo L. When I say … clinical supervision. *Medical Education*. 2017;51(9):890-891. doi:10.1111/medu.13258
7. Martin P, Copley J, Tyack Z. Twelve tips for effective clinical supervision based on a narrative literature review and expert opinion. *Medical Teacher*. 2014;36(3):201-207. doi:10.3109/0142159X.2013.852166
8. Swanwick T, Forrest K, O'Brien BC, Association for the Study of Medical Education, eds. *Understanding Medical Education: Evidence, Theory and Practice*. 3rd edition. Wiley-Blackwell; 2018.
9. ten Cate O, Scheele F. Viewpoint: Competency-Based Postgraduate Training: Can We Bridge the Gap between Theory and Clinical Practice?: *Academic Medicine*. 2007;82(6):542-547. doi:10.1097/ACM.0b013e31805559c7
10. Gilchrist T, Hatala R, Gingerich A. A collective case study of supervision and competence judgments on the inpatient internal medicine ward. *Perspect Med Educ*. Published online January 25, 2021. doi:10.1007/s40037-021-00652-1
11. Cottrell D, Kilminster S, Jolly B, Grant J. What is effective supervision and how does it happen? A critical incident study. *Med Educ*. 2002;36(11):1042-1049.
12. Kogan JR, Holmboe ES, Hauer KE. Tools for direct observation and assessment of clinical skills of medical trainees: a systematic review. *JAMA : the journal of the American Medical Association*. 2009;302(12):1316-1326. doi:10.1001/jama.2009.1365
13. Hauer KE, ten Cate O, Boscardin C, Irby DM, Iobst W, O'Sullivan PS. Understanding trust as an essential element of trainee supervision and learning in the workplace. *Adv in Health Sci Educ*. Published online July 27, 2013. doi:10.1007/s10459-013-9474-4
14. Hauer KE, Oza SK, Kogan JR, et al. How clinical supervisors develop trust in their trainees: a qualitative study. *Med Educ*. 2015;49(8):783-795. doi:10.1111/medu.12745
15. Holzhausen Y, Maaz A, Cianciolo AT, Ten Cate O, Peters H. Applying occupational and organizational psychology theory to entrustment decision-making about trainees in health care: a conceptual model. *Perspect Med Educ*. 2017;6(2):119-126. doi:10.1007/s40037-017-0336-2
16. Finn KM, Metlay JP, Chang Y, et al. Effect of Increased Inpatient Attending Physician Supervision on Medical Errors, Patient Safety, and Resident Education: A Randomized Clinical Trial. *JAMA Intern Med*. 2018;178(7):952. doi:10.1001/jamainternmed.2018.1244
17. Li S, Acai A, Sherbino J, Chan TM. The Teacher, the Assessor, and the Patient Protector: A Conceptual Model Describing How Context Interfaces With the Supervisory Roles of Academic Emergency Physicians. Coates WC, ed. *AEM Education and Training*. 2021;5(1):52-62. doi:10.1002/aet2.10431
18. Bump GM, Calabria J, Gosman G, et al. Evaluating the Clinical Learning Environment: Resident and Fellow Perceptions of Patient Safety Culture. *Journal of Graduate Medical Education*. 2015;7(1):109-112. doi:10.4300/JGME-D-14-00280.1
19. Bradley CK, Fischer MA, Walsh KE. Trends in medical error education: Are we failing our residents? *Academic Pediatrics*. 2013;13(1):59-64. doi:10.1016/j.acap.2012.10.004

20. Fischer MA, Mazor KM, Baril J, Alper E, DeMarco D, Pugnaire M. Learning from mistakes: Factors that influence how students and residents learn from medical errors. *Journal of General Internal Medicine*. 2006;21(5):419-423. doi:10.1111/j.1525-1497.2006.00420.x
21. Klasen JM, Driessen E, Teunissen PW, Lingard LA. 'Whatever you cut, I can fix it': clinical supervisors' interview accounts of allowing trainee failure while guarding patient safety. *BMJ Qual Saf*. Published online November 8, 2019:bmjqs-2019-009808. doi:10.1136/bmjqs-2019-009808
22. Klasen JM, Lingard LA. Allowing failure for educational purposes in postgraduate clinical training: A narrative review. *Medical Teacher*. Published online July 7, 2019:1-7. doi:10.1080/0142159X.2019.1630728
23. Mazor KM, Fischer M a, Haley HL, Hatem D, Rogers HJ, Quirk ME. Factors influencing preceptors' responses to medical errors: a factorial survey. *Academic medicine : journal of the Association of American Medical Colleges*. 2005;80(10 Suppl):S88-92. doi:10.1097/00001888-200510001-00024
24. Quillin RC, Pritts TA, Hanseman DJ, Edwards MJ, Davis BR. How residents learn predicts success in surgical residency. In: *Journal of Surgical Education*. Vol 70. ; 2013:725-730. doi:10.1016/j.jsurg.2013.09.016
25. Wong BM, Etchells EE, Kuper A, Levinson W, Shojania KG. Teaching quality improvement and patient safety to trainees: a systematic review. *Acad Med*. 2010;85(9):1425-1439. doi:10.1097/ACM.0b013e3181e2d0c6
26. Wong SSH, Lim SWH. Prevention–Permission–Promotion: A Review of Approaches to Errors in Learning. *Educational Psychologist*. 2019;54(1):1-19. doi:10.1080/00461520.2018.1501693
27. Wu AW, Folkman S, McPhee SJ, Lo B. Do house officers learn from their mistakes? *JAMA*. 1991;265(16):2089-2094.
28. Kennedy TJT, Regehr G, Baker GR, Lingard LA. 'It's a cultural expectation…' The pressure on medical trainees to work independently in clinical practice. *Medical Education*. 2009;43(7):645-653. doi:10.1111/j.1365-2923.2009.03382.x
29. Kennedy TJT, Regehr G, Baker GR, Lingard LA. Progressive independence in clinical training: a tradition worth defending? *Academic medicine : journal of the Association of American Medical Colleges*. 2005;80(10):106-111. doi:10.1097/00001888-200510001-00028
30. Halpern SD, Detsky AS. Graded Autonomy in Medical Education — Managing Things That Go Bump in the Night. *N Engl J Med*. 2014;370(12):1086-1089. doi:10.1056/NEJMp1315408
31. Dijksterhuis MGK, Voorhuis M, Teunissen PW, et al. Assessment of competence and progressive independence in postgraduate clinical training. *Medical Education*. 2009;43(12):1156-1165. doi:10.1111/j.1365-2923.2009.03509.x
32. Hashimoto DA, Bynum WE, Lillemoe KD, Sachdeva AK. See More, Do More, Teach More: Surgical Resident Autonomy and the Transition to Independent Practice. *Academic Medicine*. 2016;91(6):757-760. doi:10.1097/ACM.0000000000001142
33. Crockett C, Joshi C, Rosenbaum M, Suneja M. Learning to drive: resident physicians' perceptions of how attending physicians promote and undermine autonomy. *BMC Med Educ*. 2019;19(1):293. doi:10.1186/s12909-019-1732-6
34. ten Cate O, Hart D, Ankel F, et al. Entrustment Decision Making in Clinical Training: *Academic Medicine*. 2016;91(2):191-198. doi:10.1097/ACM.0000000000001044
35. Sterkenburg A, Barach P, Kalkman C, Gielen M, ten Cate O. When Do Supervising Physicians Decide to Entrust Residents With Unsupervised Tasks?: *Academic Medicine*. 2010;85(9):1408-1417. doi:10.1097/ACM.0b013e3181eab0ec
36. Ross PT, McMyler ET, Anderson SG, et al. Trainees' perceptions of patient safety practices: recounting failures of supervision. *Jt Comm J Qual Patient Saf*. 2011;37(2):88-95.
37. George BC, Dunnington GL, DaRosa DA. Trainee Autonomy and Patient Safety. *Annals of Surgery*. 2018;267(5):820-822. doi:10.1097/SLA.0000000000002599
38. Charmaz K. *Constructing Grounded Theory*. Sage Publications; 2006.
39. Watling CJ, Lingard L. Grounded theory in medical education research: AMEE Guide No. 70. *Medical Teacher*. 2012;34(10):850-861. doi:10.3109/0142159X.2012.704439
40. https://dictionary.cambridge.org/de/worterbuch/englisch/failure.

41. https://dictionary.cambridge.org/de/worterbuch/englisch/error.
42. Kapur M. Learning from productive failure. *Learning: Research and Practice*. 2015;1(1):51-65. doi:10.1080/23735082.2015.1002195
43. Kapur M. Examining Productive Failure, Productive Success, Unproductive Failure, and Unproductive Success in Learning. *Educational Psychologist*. 2016;51(2):289-299. doi:10.1080/00461520.2016.1155457
44. Varpio L, Nagler A. The bumps and bruises from turning a blind eye: Learning from our failures and surprises. *Perspect Med Educ*. 2018;7(S1):1-3. doi:10.1007/s40037-018-0421-1
45. Young M. The utility of failure: a taxonomy for research and scholarship. *Perspect Med Educ*. 2019;8(6):365-371. doi:10.1007/s40037-019-00551-6
46. Steenhof N, Woods NN, Van Gerven PWM, Mylopoulos M. Productive failure as an instructional approach to promote future learning. *Adv in Health Sci Educ*. 2019;24(4):739-749. doi:10.1007/s10459-019-09895-4
47. Steenhof N, Woods NN, Mylopoulos M. Exploring why we learn from productive failure: insights from the cognitive and learning sciences. *Adv in Health Sci Educ*. 2020;25(5):1099-1106. doi:10.1007/s10459-020-10013-y
48. Mylopoulos M, Steenhof N, Kaushal A, Woods NN. Twelve tips for designing curricula that support the development of adaptive expertise. *Medical Teacher*. 2018;40(8):850-854. doi:10.1080/0142159X.2018.1484082
49. Patton MQ. *Qualitative Evaluation and Research Methods*. 2nd ed. Sage Publications; 1990.
50. Morse JM. Determining Sample Size. *Qual Health Res*. 2000;10(1):3-5. doi:10.1177/104973200129118183
51. Tavakol M, Torabi S, Akbar Zeinaloo A. Grounded Theory in Medical Education Research. *Medical Education Online*. 2006;11(1):4607. doi:10.3402/meo.v11i.4607
52. Sherbino J, Dore KL, Wood TJ, et al. The Relationship Between Response Time and Diagnostic Accuracy: *Academic Medicine*. 2012;87(6):785-791. doi:10.1097/ACM.0b013e318253acbd
53. Gigerenzer G. *Gut Feelings: The Intelligence of the Unconscious*. Viking; 2007. Accessed May 5, 2020. http://www.myilibrary.com?id=705549
54. Greenhalgh T. Intuition and evidence--uneasy bedfellows? *Br J Gen Pract*. 2002;52(478):395-400.
55. Zander T, Öllinger M, Volz KG. Intuition and Insight: Two Processes That Build on Each Other or Fundamentally Differ? *Front Psychol*. 2016;7. doi:10.3389/fpsyg.2016.01395
56. Edwards IR. Intuition, evidence, and safety. *The Lancet*. 2004;364(9431):387. doi:10.1016/S0140-6736(04)16730-5
57. Harteis C, Billett S. Intuitive expertise: Theories and empirical evidence. *Educational Research Review*. 2013;9:145-157. doi:10.1016/j.edurev.2013.02.001
58. Harteis C, Frost F. Error Orientation in the Context of Intuitive and Competent Behaviour: Results of an Exploratory Study in the Domain of Emergency Medicine. In: Bauer J, Harteis C, eds. *Human Fallibility*. Vol 6. Springer Netherlands; 2012:141-153. doi:10.1007/978-90-481-3941-5_9
59. Coombes R. Think rationally rather than intuitively to avoid diagnostic errors, doctors are told. *BMJ*. 2010;341(nov23 3):c6705-c6705. doi:10.1136/bmj.c6705
60. Kahneman D, Klein G. Conditions for intuitive expertise: A failure to disagree. *American Psychologist*. 2009;64(6):515-526. doi:10.1037/a0016755
61. Norman G, Sherbino J, Dore K, et al. The Etiology of Diagnostic Errors: A Controlled Trial of System 1 Versus System 2 Reasoning. *Academic Medicine*. 2014;89(2):277-284. doi:10.1097/ACM.0000000000000105
62. Norman GR, Monteiro SD, Sherbino J, Ilgen JS, Schmidt HG, Mamede S. The Causes of Errors in Clinical Reasoning: Cognitive Biases, Knowledge Deficits, and Dual Process Thinking. *Academic Medicine*. 2017;92(1):23-30. doi:10.1097/ACM.0000000000001421
63. Flin R, Youngson G, Yule S. How do surgeons make intraoperative decisions? *Quality and Safety in Health Care*. 2007;16(3):235-239. doi:10.1136/qshc.2006.020743
64. Klasen JM, Lingard LA. The butterfly effect in clinical supervision. *Perspect Med Educ*. Published online March 22, 2021:s40037-021-00659-8. doi:10.1007/s40037-021-00659-8

65. Durning SJ, Lubarsky S, Torre D, Dory V, Holmboe E. Considering "Nonlinearity" Across the Continuum in Medical Education Assessment: Supporting Theory, Practice, and Future Research Directions. *Journal of Continuing Education in the Health Professions*. 2015;35(3):232-243. doi:10.1002/chp.21298
66. Atkinson RB, Smink DS. Allowing failure so trainees can thrive: the importance of guided autonomy in medical education. *BMJ Qual Saf*. Published online February 21, 2020:bmjqs-2019-010673. doi:10.1136/bmjqs-2019-010673
67. Ten Cate O, Billett S. Competency-based medical education: Origins, perspectives and potentialities. *Medical Education*. 2014;48(3):325-332. doi:10.1111/medu.12355
68. Pangaro L, ten Cate O. Frameworks for learner assessment in medicine: AMEE Guide No. 78. *Medical Teacher*. 2013;35(6):e1197-e1210. doi:10.3109/0142159X.2013.788789
69. Chen X (Phoenix), Sullivan AM, Alseidi A, Kwakye G, Smink DS. Assessing Residents' Readiness for OR Autonomy: A Qualitative Descriptive Study of Expert Surgical Teachers' Best Practices. *Journal of Surgical Education*. 2017;74(6):e15-e21. doi:10.1016/j.jsurg.2017.06.034
70. Williams RG, George BC, Meyerson SL, et al. What factors influence attending surgeon decisions about resident autonomy in the operating room? *Surgery*. 2017;162(6):1314-1319. doi:10.1016/j.surg.2017.07.028
71. Mieczkowski AE, Rubio D, Van Deusen R. Perceptions of Internal Medicine–Pediatrics Residents About Autonomy During Residency. *Journal of Graduate Medical Education*. 2014;6(2):330-334. doi:10.4300/JGME-D-13-00125.1
72. Biondi EA, Varade WS, Garfunkel LC, et al. Discordance Between Resident and Faculty Perceptions of Resident Autonomy: Can Self-Determination Theory Help Interpret Differences and Guide Strategies for Bridging the Divide? *Academic Medicine*. 2015;90(4):462-471. doi:10.1097/ACM.0000000000000522
73. Bynum WE, Artino AR, Uijtdehaage S, Webb AMB, Varpio L. Sentinel Emotional Events: The Nature, Triggers, and Effects of Shame Experiences in Medical Residents. *Academic Medicine*. 2019;94(1):85-93. doi:10.1097/ACM.0000000000002479
74. Lases SS, Slootweg IA, Pierik EGJM, Heineman E, Lombarts MJMH. Efforts, rewards and professional autonomy determine residents' experienced well-being. *Advances in Health Sciences Education*. 2018;23(5):977-993. doi:10.1007/s10459-018-9843-0
75. Dwyer SC, Buckle JL. The Space Between: On Being an Insider-Outsider in Qualitative Research. *International Journal of Qualitative Methods*. 2009;8(1):54-63. doi:10.1177/160940690900800105
76. Helmich E, Cristancho S, Diachun L, Lingard L. 'How would you call this in English?': Being reflective about translations in international, cross-cultural qualitative research. *Perspect Med Educ*. 2017;6(2):127-132. doi:10.1007/s40037-017-0329-1
77. Lingard L. Language matters: towards an understanding of silence and humour in medical education: Language matters. *Medical Education*. 2013;47(1):40-48. doi:10.1111/medu.12098



5

Using trainee failures to enhance learning: A qualitative study of pediatric hospitalists on allowing failure

Published as
Klasen JM, Beck J, Randall CL, Lingard L.
Using Trainee Failures to Enhance Learning: A Qualitative Study of Pediatric Hospitalists on Allowing Failure.
Acad Pediatr. 2023 Mar;23(2):489-496.

Abstract

Introduction: Attendings allow trainee failure when perceived educational benefits outweigh potential patient harm. This strategy has not been explored in pediatrics, where it may be shaped by unique factors. Our objectives were to understand if, when, and how pediatric hospitalists allow trainees to fail during clinical encounters.

Methods: Using constructivist grounded theory, we conducted semi-structured interviews with 21 pediatric hospitalists from a children's hospital in the United States. Iterative, constant comparative analysis took place concurrent with data collection. During regular team meetings, we refined and grouped codes into larger themes.

Results: 19 of the 21 participants shared that they intentionally allowed failure as a teaching strategy, acknowledging this strategy's emotional power and weighing the educational benefits against harms to current and future patients, caregivers, and trainees. Participants described a multi-step process for allowing failure: 1) initiate an orientation to signal that they prioritize a psychologically safe learning environment; 2) consider factors which influence their decision to allow failure; and 3) debrief with trainees. However, participants did not explicitly alert trainees to this teaching strategy. They also avoided using the word 'failure' during debriefs to protect trainees from psychological harm.

Conclusions: Most pediatric hospitalists in this study allowed failure for educational purposes. However, they did so cautiously, weighing the educational value of the failure against the safety of both current and future patients, the relationship with the caregivers, and the trainees' well-being. Future research should involve trainees and caregivers to more comprehensively understand the experience and effectiveness of this teaching strategy.

Introduction

Outside of medicine, failure is commonly viewed as a requisite for learning and innovation.[1] Within medicine, learners have acknowledged that failure is both common and impactful,[2] but failure is also a fraught notion.[3,4] In the clinical setting, attendings have been found to allow failure for educational purposes if patient safety is not compromised.[5] Examples from that study of allowed failure included technical failures such as selecting the wrong plane during an operation and diagnostic failures such as ordering an ultrasound instead of a computed tomography scan. Supervisory decisions to allow failure are both high stakes and context specific, varying according to patient, trainee, and supervisor factors as well as environmental context.[6] With such complexity and variability comes unpredictability. For instance, failure may be allowed in one situation but not another, and individuals may approve of one allowed failure but not another. This has implications for our ability to critically discuss and develop potential ways to use this teaching strategy.

One aspect of context that is underexplored is the role of specialty training culture and norms in the use of allowed failure as a teaching strategy. Attending physicians from different specialties and settings handle the supervision and autonomy of trainees differently.[7] For instance, recent work suggested that pediatrics constitutes a specialty training culture in which supervisors might be reluctant to allow failure.[5] This suggestion is supported by a small amount of literature reporting that pediatric trainees have less autonomy compared to other specialties[8,9] and that the presence of family members can complicate the learning environment for pediatric trainees.[10] Given this emerging literature, pediatrics presents an excellent opportunity to further explore how attending physicians navigate the balance of trainee learning and patient well-being when considering whether to allow failure. Therefore, this study asked: how do pediatric hospitalist attendings allow trainees to fail during clinical performances for educational benefit and when do they exercise this strategy?

Methods

Study design

This study used a constructivist grounded theory (CGT) approach. We chose this approach because CGT is a methodology that attempts to build theory around data generated from complex cognitive and social processes, such as the use of allowed failure.[11] It was reviewed by the IRB at Seattle Children's Hospital and deemed to meet exempt status.

Study Team

Our research team combined the perspectives of attending physicians and social scientists. The principal investigators are both physicians who have experience with qualitative methodology: J.M.K. in abdominal surgery, J.B. in pediatrics. J.B. is a faculty member in the same division as the participants and thus was aware of the strong culture of patient safety at the institution. C.L.R. is a clinical health psychologist with expertise in qualitative research and significant experience facilitating qualitative interviews with health care providers. L.L. is a social scientist and education researcher with extensive CGT experience. The 2 coders (J.M.K. and J.B.) are also parents, an orientation that explicitly arose during the development of our interview guide and analytical conversations.

Data instruments

Our semi-structured interview guide used the definition of allowed failure[6] to explore participants' experiences and understanding of this teaching strategy. We provided the definition to the participants at the beginning of the interview: "While supervising a trainee's clinical performance, the supervisor, influenced by both intuition and a non-linear interplay of different factors, detects an imminent trainee mistake and has the opportunity to intervene but chooses not to do so because the educational gain for the trainee is perceived to outweigh the potential consequences for the patient." In addition, the interviewers were intentionally consistent in their use of precise phrasing throughout the interview to differentiate the construct of "allowed failure" from other similar yet distinct constructs, such as "mistakes" and "errors." To increase participant comfort in discussing sensitive topics, we prompted reflections on a hypothetical pediatric vignette, in part to elucidate factors which may influence an attending's decision to allow failure.[12,13]

Sampling Frame

Using theoretical sampling, we invited all pediatric hospitalist attendings (n = 74) from a university-affiliated, freestanding children's hospital in the United States via e-mail. In our e-mail, we explained to potential participants that our aim was to understand whether they allowed failure for educational purposes and, if so, how and why. Of the 74 invited attendings, 26 were willing to participate voluntarily. With the strategy of purposive sampling, we sought to interview information-rich participants who represented diversity in gender and academic rank.[14] At 21 interviews we judged the sample sufficient, signaled by the final 2 interviews yielding no new insights regarding identified patterns.

Data collection and analysis

From May to October 2021, J.B. and C.L.R. conducted individual interviews via videoconference call. Interviews ranged from 52 to 90 minutes and were digitally recorded, transcribed, anonymized, and spot-checked for data integrity. Data collection and analysis were concurrent and iterative, following CGT procedures.[11] Data analysis was supported by Dedoose (version 7.0.23). The coders (J.M.K. and J.B.) developed a codebook after independently reading and coding 3 transcripts. This preliminary analysis informed minor modifications to the interview guide to enhance insights into recurring themes. Subsequently, each transcript was coded by either J.M.K. or J.B., with periodic reconciliations every fifth transcript to discuss inconsistencies and refine the codebook. During these meetings, they also shared their experiences of and reactions to the data, often returning to the raw data to ensure that their interpretation reflected participant perspectives and did not inappropriately emphasize their own perceptions of this teaching strategy. The research team met regularly to engage in analytical discussions, during which we refined and grouped the codes into larger themes and considered relationships among them.[11]

Results

Twenty-one hospitalist attending physicians (28% of hospitalists at the study site) participated in the study. Table 1 shows participant characteristics. All of our participants provided rich descriptions about the phenomenon of allowed failure. Nineteen of the participants shared that they intentionally allow trainee failure for the purpose of learning. Two participants (P#5, P#15) described allowing their trainees to struggle but denied allowing failure due to patient safety reasons. Below we present participants' perspectives about the perceived potential benefits and downsides of this strategy; the processes by which they allowed failure; and the factors that influenced decisions to use this strategy.

Perceived potential benefits

Participants who allowed failure believed that it had potential benefits. Their own memories of failure during training were vivid, admitting that "It's the failures that I can recall years later" (P#14), or recalling that "I can say from my own experience failing at a procedure [lumbar puncture] that it sucks, it's awful... The next time I was super careful about positioning and making sure everything was set up before I did it" (P#21). Participants connected the value of allowed failure to its emotional impact. Perceiving those negative emotions improved retrieval, they viewed failing as a more powerful learning experience

Table 1: Demographic Characteristics for 21 Participants, From a Study of Pediatric Hospitalists on Using Failure As a Teaching Strategy, 2021-22

CHARACTERISTIC	VALUE, NO. (%)
Gender	
Female	11 (52%)
Male	10 (48%)
Years of practice	
0 - 5 years	3 (14%)
6 - 10 years	8 (38%)
11 - 15 years	5 (24%)
16 - 20 years	2 (1%)
> 21 years	3 (14%)
Academic appointment	
Instructor	1 (1%)
Assistant professor	6 (29%)
Associate professor	11 (52%)
Professor	3 (14%)
Faculty track	
Clinical faculty	14 (66%)
Clinician scholar	6 (28%)
Research scientist	1 (1%)

than succeeding: "When trainees do the right thing, there is usually not much emotion attached to that and so I question how much they actually really remember and learn. So that's why I think it's so meaningful for them to fail and let things play themselves out" (P#3). One attending contrasted the amount of potential learning during rounds if he allowed failure with that if he corrected a trainee prior to failure: "I allowed them to fail so that we could then create a bit of a more impactful, teachable moment at a different point in time" (P#9). Participants also reasoned that allowing failure would benefit not only trainees but also their future patients:

> We need to stop thinking about patient safety only in the present tense. We need to recognize that our trainees will one day be responsible for thousands of patients once they graduate. I feel as though we have a huge responsibility to those patients as well. I can't think of a better time [to let trainees fail] than during their 3 years of training, when I can swoop in and rescue or reverse any real badness that they create (P#9).

Concerns about perceived potential harms

Although most of our participants admitted they allowed failure as a teaching strategy, they also described reasons to avoid this strategy: potential harm to the patient and caregiver, and potential harm to the trainee. Participants expressed concern that trainee failures not cause undue harm, and they described not allowing failure when they perceived the potential harm to be unacceptable. Undermining patient or family trust was recurrently viewed as unacceptable, creating reluctance to allow communication failures in particular: "I can't let people communicate incorrectly because I think it undermines trust" (P#15). While lost trust was viewed as unacceptable, other kinds of harm seemed more acceptable. These included diagnostic failures such as not obtaining imaging in a timely manner which delayed surgical drainage of an abscess by about 18 hours (P#2); procedural failures such as inserting the lumbar puncture needle at an incorrect angle (P#7); and patient management failures like when a patient who required higher levels of respiratory support was not transferred to the intensive care unit overnight (P#13).

Psychological harm to trainees was another recurring reason for not allowing failure as a teaching strategy, perceiving that trainees may be emotionally impacted by the event. Therefore, they argued that "it needs to be done in such a way that trainees' egos aren't harmed in the process. If they can't overcome the fact that their attending allowed for a patient to be harmed for their benefit, they won't have the headspace to learn" (P#11). Significant psychological harm was viewed as a threat to learning.

How attendings use allowed failure as a teaching strategy

The interviews offered insights into attendings' multi-step (though not necessarily linear) theoretical model to using allowed failure as a teaching strategy, which includes the set-up, decision-making factors, allowing or interrupting the failure, and conducting a debrief conversation (Figure).

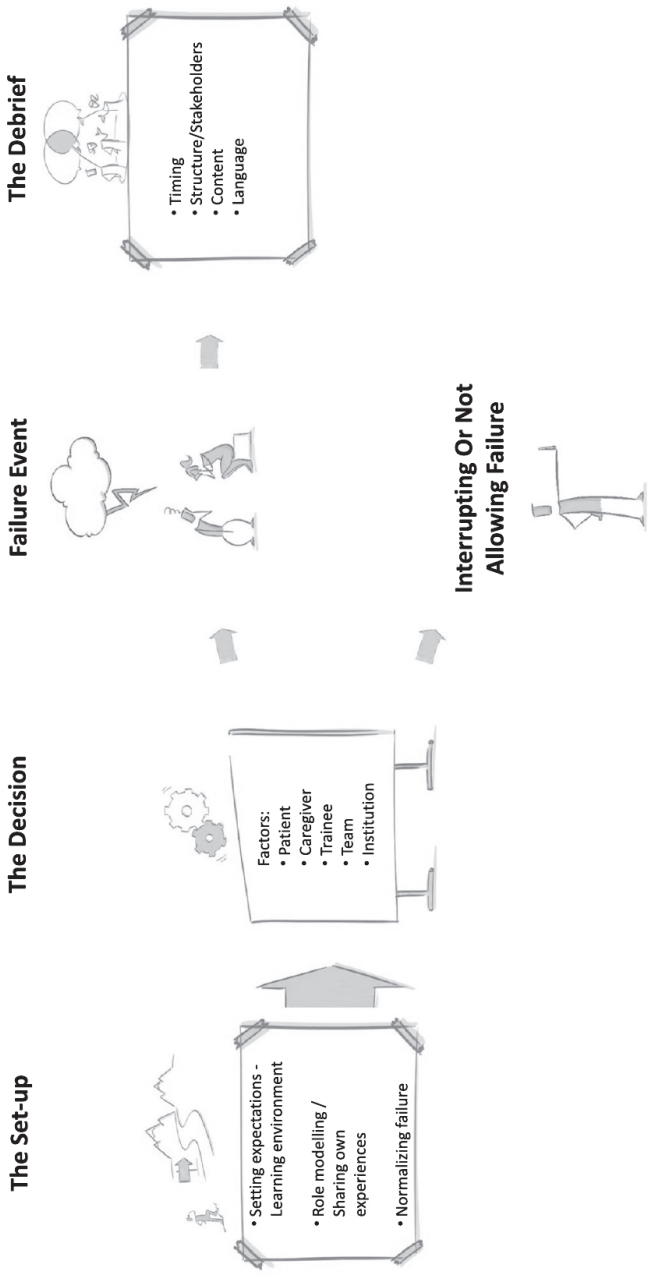


Figure. Theoretical model of how attendings allow failure.

The Set-up

Many attendings aimed for a brief orientation session at the beginning of their service time to discuss team culture and build trust with trainees so that, when they fail, they are better able to learn from it. One participant stated:

> At the start of my service week, I frame failure and mistakes as a learning opportunity, more than a personal moral bankruptcy on the part of the resident. If you've already set up some of that environment, then I think it can be a lot easier to let trainees make mistakes (P#8).

Other attendings described the importance of normalizing mistakes and, therefore, allowing failure: "It's more normalizing the fact that mistakes will happen and that I will give feedback afterwards when they do and that making mistake is part of being a doctor" (P#17). However, no participants indicated that they explicitly told their trainees as part of orientation that they would be allowed to fail.

The decision

When participants reflected on whether to allow a trainee to fail in a given situation, they reported considering 5 main factors: 1) patient, 2) trainee, 3) team, 4) institution, and 5) caregivers. The first 4 factors confirm previous research and are summarized in Table 2. We discuss the caregiver factor in more detail because it is novel and particularly important in pediatric hospital medicine, where parents are frequently directly involved in the care of their children. Key elements of the caregiver factor are the family's presence, their emotional state, and their need for provider accountability. Some participants allowed failure "regardless of whether or not the family is there" (P#1), but others noted that the presence of the family influenced the decision. One participant reflected that "there might be some more permissiveness for failure if there's not family present in the rounds" (P#14), while another unpacked this further, explaining that "if the family is in the room [during rounds] I'm going to be worried about the parent and the caregiver and what burden and stress are they experiencing because I'm allowing this to fail or allowing this to happen" (P#8).

The emotional state of families mattered to participants outside of rounds as well. Participants would hesitate to allow failure if the family is "really anxious" (P#8) or "... if the family is already in a heightened emotional situation" (P#7). If a family was perceived as "being demanding" (P#3) or "really challenging" (P#1), participants reported they were less likely to allow failure. "Challenging" families were contrasted with easygoing families who were perceived as more

Table 2: Participants' Perspectives on Key Factors Which Guided the Use of Allowing Failure Along With Representative Example Quotations, From a Study of Pediatric Hospitalists on Using Failure As a Teaching Strategy, 2021-22

FACTOR	DESCRIPTION	EXAMPLE QUOTATIONS
Patient	Allowing failure: When a patient won't suffer long term, irreversible or severe harm.	"I will sometimes do it [allow failure] even when there is pain associated with a blood draw. Because in my mind, the pain wouldn't necessarily outweigh the value of failure on ijs own. Similarly, with medication errors, I will allow that because a lot of time, the harm is minimal and I can probably un-do any of the harm pretty quickly. And I think there is great learning to be had with those situations" (P#4).
	Not allowing failure: When a patient is worsening, deteriorating, or considered to be critically ill.	"I will only do this when there's low-harm for the patient, very, very low harm. Where there is a change in their clinical outcome or [if the failure] results in unnecessary stress or burden or harm to the patient and family. ... I'm not going to let it happen" (P#8).
Trainee	Allowing failure: When the perception of possessing a "growth mindset" by a trainee influences the impression of a trainee to benefit from failure through honest and constructive feedback.	"I think it's a good opportunity to allow failure when [trainees] have the capacity to change, capacity to respond to failures, and when they realize that [failures] don't define us" (P#16).
	Trainee-Attending relationship Allowing failure: When the attending and the trainee have established trust and a working relationship.	"If it's my very first day working with an intern and it's July or August. I may not give them much leeway before I step in versus a third year Peds resident that I've worked with 2 or 3 times in the past that I have rapport wijh, because I know how they're going to process [a failure] afterwards" (P#2).
	Not allowing failure: When the attending and the trainee do not have established trust or confidence.	"Before COVID, it was much easier. We could get coffee at Starbucks, or I would even invite my team over for dinner. Once residents know you care, I think it's easier to use these sorts of unconventionatle aching strategies.I would never spring this teaching strategy on a learner who I didn't know well and vice versa" (P#9).
Team	Allowing failure: When the overall team responsibilities, requirements duties, and patient care needs are in balance with the attending's perception of their ability to engage in a learning opportunity.	"I think a big thing that affects allowing someone to fail is the capacity of the team, the resident, the hospital. So specifically, if the team isn't super busy and stretched thin, I'm more likely to let them fail" (P#13).
	Not allowing failure: When the cognijive load of the team is deemed to be greater than the team's capacity for learning.	"If things are busy, well then allowing failure is going to have to take a back seat because it's not like the residents are going to learn from their failure anyways. Instead, we just need to deliver excellent patient care and excellent communication" (P#5).
lnstitution	Allowing failure: When the influence of institutional priorities and values are such that an attending perceivest hat allowing failure is culturally accepted.	"I wonder if some of our culture here being passive-aggressive just allows for failure more because we don't want to be confrontational" (P#8).
	Not allowing failure: When the influence of the institution's culture is such that ij negatively impacts an attending's perception of the accepted nature of failure.	"I think that the culture of our institution and its obsession with patient safety definitely will make this hard for others to implement. I obviously worry about the harm to the patient, there's that very real considerationA. nd then there's the institutionavl iew, I guess what it meanst o allow possible failure and possible harm, that cultural factor can weigh even heavier I think at times" (P#14).

tolerant of, for example, additional tests or procedures due to allowed failure. One participant reflected that "a lot of it would be, how nervous is this family, what kind of vibe are they giving you, are they okay with many interventions. If it's not a big deal to them, then I think that's okay [to allow failure]" (P#19).

Participants viewed themselves as accountable to families and suggested that allowed failure was more acceptable against a backdrop of a satisfied family. One explained that "I feel like we can make mistakes, but as long as I feel like the parents are happy with me and my communication, they will be very understanding" (P#16). As part of this accountability, preserving the trust of families was repeatedly expressed as paramount: "They trust us to know that we are not going to let true harm, however you define that, to come to their child, and so, they're willing to allow us to go a little bit further sometimes" (P#18). By extension, a perceived lack of trust was a reason not to allow failure for learning, such as "if the family is having a tough time connecting [with the medical team]" (P#9).

The debrief

All participants agreed that debriefing was critical after an allowed failure: The value of an allowed failure for trainees was perceived to be supported by a guided debrief with the attending to learn from the situation. Participants also described how to conduct this conversation to ensure that learning occurred. Immediate debriefs were thought to minimize stress: "I try not to allow trainees to stew. Meaning, it's really stressful for a trainee to have to wait to speak with their attending after a mistake or failure. I would never say, hey, let's chat about so and so tomorrow. I bet they won't sleep well at night" (P#9).

In terms of debrief participation, attendings shared a range of preferences. Some attendings perceived value in doing a group debriefing to let "the whole team to learn from the [failed] case" (P#12). Less commonly, attendings chose to "take them aside one-on-one" (P#11) to minimize trainee embarrassment or trauma in case "... the individual would feel singled out or if it was a more sensitive conversation" (P#11). However, attendings also "try to distribute or dilute any perceived blame in terms of not addressing just that person but addressing the whole group" (P#11).

Participants also described the specific language they would use during debriefs. None said that they explicitly told trainees that they had intentionally "allowed" failure. One attending justified not "admit[ing] to a trainee that I saw the mistake coming and allowed the failure" because they "just don't think there's value to that. There are some things that are better off left unsaid" (P#1). Most acknowledged

that they avoided the term "failure" because they were "worried" [trainees] would suffer more harm than good. One explained that "I think trainees know when they have messed up You know when you are in trouble. So, I don't find there is any benefit in explicitly using the word 'failure'" (P#8). By avoiding the explicit use of the word "failure" during debriefing sessions, our participants sought to lessen the likelihood of psychological harm to learners.

Discussion

Past research suggested that attendings allow trainees to fail when their potential educational benefit outweighs the potential harm to patients. Our study confirms those results, while the presented theoretical model summarizes pediatric attendings' perceptions of why and how they allow failure, extending previously published work in 4 ways.[5,6] First, it suggests that this teaching strategy may be used by pediatricians, whose training culture might be different than other physicians' because of the responsibility to children *and* their families, who are often involved as caregivers.[15,16] Second, it advances our understanding of how supervisors decide whether or not to allow failure, including their consideration of caregiver factors and benefits to future patients. Third, it provides a foundation to understand the process by which attendings decide when to allow trainees to fail and how to handle their failure experiences through orientation and debriefing. Last, it provides new insights into the connection between allowed failure and trainee wellbeing.

In addition to confirming the findings of previous research[6] demonstrating that patient-, trainee-, supervisor-, and environment-related factors influence the decision to allow failure, our study revealed the importance of caregiver factors for such decision making in the pediatrics setting. The described caregiver factors, which highlight a unique aspect of pediatrics compared with other training and care settings, led our participants to express a particular reluctance to allowing communication failures, as these were perceived to threaten the family's trust in the team and to potentially cause irreversible harm to the relationship. This concern is supported by previous studies of pediatric caregivers which have shown that clear communication affects caregivers' hospital experience[17,18] and has health implications for the hospitalized child.[19,20] Our participants' emphasis on caregiver factors in their decisions about allowing failure may not be unique to pediatrics; future work could explore how supervisors decide to allow failure in other inpatient settings where caregivers have a prominent role, such as geriatrics or intensive care units.

Another novel contribution of this study is the in-depth identification of the consideration of future patients in decision making about whether to allow failure. Past research has mainly suggested that attendings choose between the current patient's safety and the current trainee's learning. Our results suggest that the choice is characterized by additional nuance. Reflecting an understanding that failure is inevitable in medicine,[2,21] our participants worried that trainees who have not been allowed to fail may be unsafe after graduation, when practicing independently. That is, participants of our study believed that attendings should weigh both the actual safety concerns for current patients against or in tandem with the hypothetical safety concerns for future patients. Thus, they did not characterize the decision as simply allowing or avoiding failure; rather they characterized it as allowing trainees to fail with supervision today versus encounter failure without supervision later. Such considerations for future patients make the decision to allow failure more nuanced than previously described. Like participants of previous studies,[5] our participants were concerned about the negative emotional impact of allowed failure on trainees and cited this as a potential reason to not allow failure. They perceived that learners may encounter distress from clinical failures and suggested that experiencing *shame* in the context of the allowed failure may impede learning.[22,23] This notion is consistent with previous reports that failure can be an emotionally triggering event,[22,24] and in fact can be a potential barrier to learning from an error, possibly "causing more attention to be directed to emotional support than to correction and instruction."[22,25] It is unclear whether the impact of emotions associated with an allowed failure differs from those associated with an unintentional, non-strategic failure. Regardless, attendings in our study seem to view these emotionally charged situations as valuable for learning. This viewpoint is supported by the concept of control-value theory, which asserts that some negative emotions such as anxiety can actually improve future performance.[26] As such, in a learning environment where learners feel supported, attendings may be able to utilize negative emotions related to failure as an innovative learning strategy, so long as the intensity of the emotion isn't too severe.

The study results presented here also include suggestions from our pediatric hospitalist attending participants about how they implement allowed failure as a teaching strategy. Participants highlighted the importance of setting the stage and creating a psychologically safe learning environment, which echoes the medical error literature.[27] However, they avoided announcing to their learners during orientation sessions that they might allow failure for educational purposes; they did not tell learners after the failure that they had "allowed" it;

and many avoided naming the event as a "failure" during debriefing sessions. Why this discrepancy?

We suggest 3 reasons. First, it may be a manifestation of the documented lack of candor in feedback and assessment in medical education,[28,29] where attendings avoid conversations that feel threatening. Second, it might reflect a concern for the supervisory relationship: if an attending admits they "allowed failure," the trainee may not feel confident that their attending will act as a safety net for them as they work at the edge of their competence. Third, it may be a strategy to protect learners from the psychological harm supervisors worry might be prompted by the language of "failure." As a protective strategy, avoiding the "f-word" is consistent with a trend toward more humane learning environments in medical education.[30–32] Positive aspects of this trend include recognition and acknowledgement of learners' experiences of shame and guilt,[33,34] depression,[35] and burnout;[36] problematic aspects include the "failure to fail" phenomenon[28] and the absence of constructive feedback by faculty.[37]

Despite those reasons, because attendings view allowing failure for learning as an acceptable teaching strategy, we believe they should consider being more explicit about it. How can this be implemented? First, attendings should normalize failure, including their own. Second, it is important that attendings develop a strong educational alliance with their trainees, a construct which Telio et al. describe as grounded in the belief that the attending has an "authentic interest early in the relationship," and where the trainee believes the relationship is about "me becoming the best clinician I can be."[38] Only once this alliance has been established and can a debrief session following an allowed failure lead to actual growth in trainees.

This work is limited by its design. First, semi structured interviews follow the participants' lead to probe individual experience and meaning, and therefore our results are necessarily retrospective and perceptual. Recurring patterns are captured in our model of attending decision-making regarding allowed failure, but this too is perceptual, and many nuances remain to be explored (such as how supervisors weigh the relative risks to current and future patients). Field research involving the observation of attendings and trainees in their actual clinical/training settings would provide further insight into how this supervisory model is practiced in real time and the effectiveness of learning from failure.

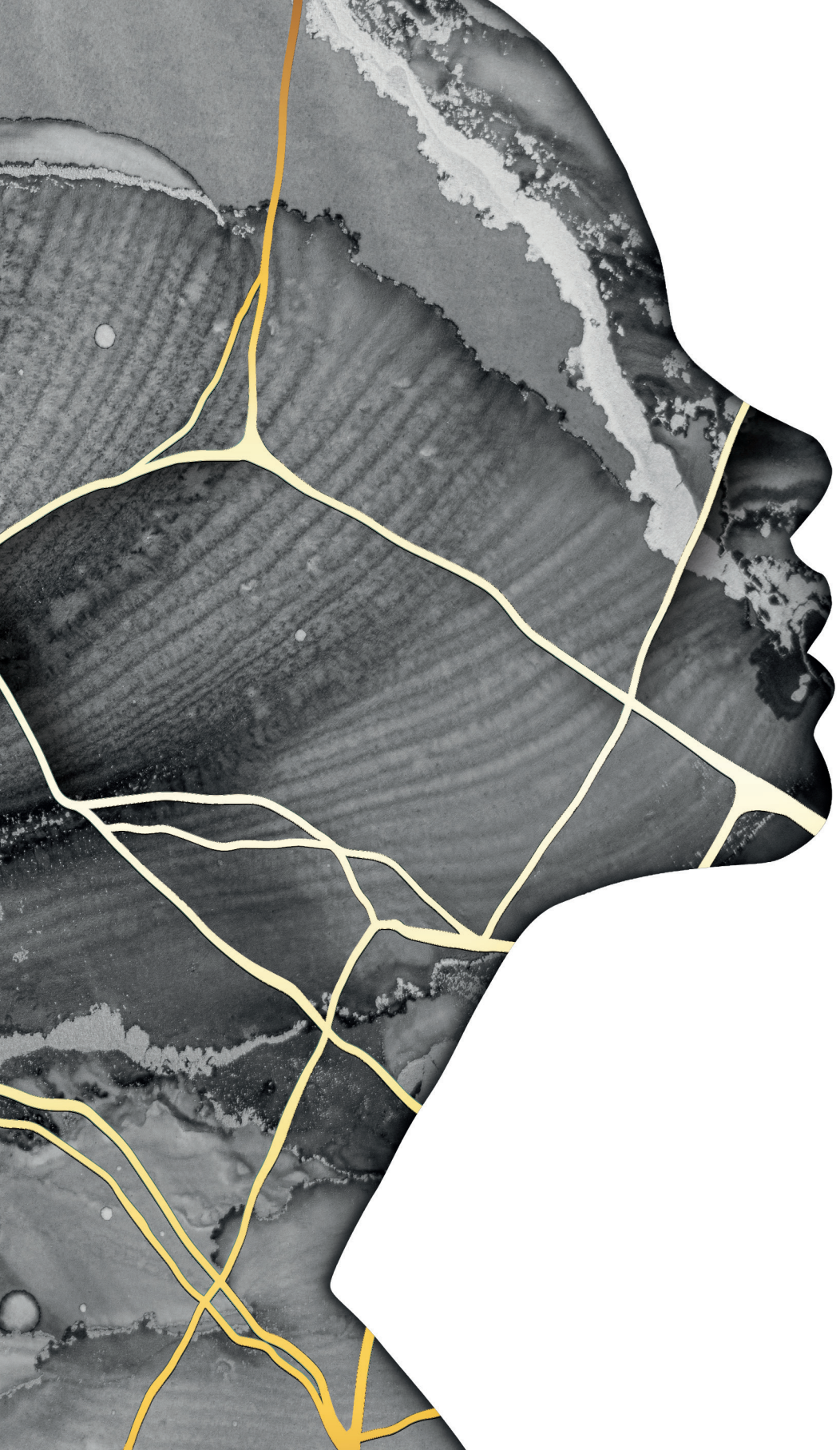
Conclusions

Pediatric hospitalists allow failure as a teaching strategy for educational purposes. However, they do so cautiously, weighing the educational value of the failure against the safety of both current and future patients, the relationship with the caregivers, and the trainees' well-being. Efforts to orient and debrief trainees regarding allowed failure tend to be implicit, suggesting that we need to develop strategies for explicitly talking about failure while protecting trainees from psychological harm. Future research should involve trainees to understand the experience and effectiveness of this teaching strategy more comprehensively.

References

1. Edmondson A. Strategies of learning from failure. *Harv Bus Rev*. 2011;89(4):48-55, 137.
2. Wu AW, Folkman S, McPhee SJ, Lo B. Do house officers learn from their mistakes? *JAMA*. 1991;265(16):2089-2094.
3. Scarff CE, Bearman M, Chiavaroli N, Trumble S. Keeping mum in clinical supervision: private thoughts and public judgements. *Medical Education*. 2019;53(2):133-142. doi:10.1111/medu.13728
4. Klasen JM, Lingard LA. Allowing failure for educational purposes in postgraduate clinical training: A narrative review. *Medical Teacher*. Published online July 7, 2019:1-7. doi:10.1080/0142159X.2019.1630728
5. Klasen JM, Driessen E, Teunissen PW, Lingard LA. 'Whatever you cut, I can fix it': clinical supervisors' interview accounts of allowing trainee failure while guarding patient safety. *BMJ Qual Saf*. Published online November 8, 2019:bmjqs-2019-009808. doi:10.1136/bmjqs-2019-009808
6. Klasen JM, Teunissen PW, Driessen EW, Lingard LA. 'It depends': The complexity of allowing residents to fail from the perspective of clinical supervisors. *Medical Teacher*. Published online October 11, 2021:1-10. doi:10.1080/0142159X.2021.1984408
7. Jenkins TM. Dual Autonomies, Divergent Approaches: How Stratification in Medical Education Shapes A pproaches to Patient Care. *J Health Soc Behav*. 2018;59(2):268-282. doi:10.1177/0022146518765174
8. Mieczkowski AE, Rubio D, Van Deusen R. Perceptions of Internal Medicine–Pediatrics Residents About Autonomy During Residency. *Journal of Graduate Medical Education*. 2014;6(2):330-334. doi:10.4300/JGME-D-13-00125.1
9. Baldwin CD, Shone L, Harris JP, Craig MS, Cellini MM, Varade WS. Development of a Novel Curriculum to Enhance the Autonomy and Motivation of Residents. *Pediatrics*. 2011;128(4):633-636. doi:10.1542/peds.2011-1648
10. Fein JA, Ganesh J, Alpern ER. Medical Staff Attitudes Toward Family Presence During Pediatric Procedures: *Pediatric Emergency Care*. 2004;20(4):224-227. doi:10.1097/01.pec.0000121241.99242.3b
11. Charmaz K. *Constructing Grounded Theory: A Practical Guide through Qualitative Analysis*. Repr. Sage; 2012.
12. Törrönen J. Using vignettes in qualitative interviews as clues, microcosms or provokers. *QRJ*. 2018;18(3):276-286. doi:10.1108/QRJ-D-17-00055
13. Jenkins N, Bloor M, Fischer J, Berney L, Neale J. Putting it in context: the use of vignettes in qualitative interviewing. *Qualitative Research*. 2010;10(2):175-198. doi:10.1177/1468794109356737
14. Patton MQ. *Qualitative Evaluation and Research Methods*. 2nd ed. Sage Publications; 1990.
15. Tong H, Qiu F, Fan L. Characterising common challenges faced by parental caregivers of children with type 1 diabetes mellitus in mainland China: a qualitative study. *BMJ Open*. 2022;12(1):e048763. doi:10.1136/bmjopen-2021-048763
16. Rennick JE, St-Sauveur I, Knox AM, Ruddy M. Exploring the experiences of parent caregivers of children with chronic medical complexity during pediatric intensive care unit hospitalization: an interpretive descriptive study. *BMC Pediatr*. 2019;19(1):272. doi:10.1186/s12887-019-1634-0
17. Khan A, Furtak SL, Melvin P, Rogers JE, Schuster MA, Landrigan CP. Parent-Provider Miscommunications in Hospitalized Children. *Hospital Pediatrics*. 2017;7(9):505-515. doi:10.1542/hpeds.2016-0190
18. Khan A, Rogers JE, Melvin P, et al. Physician and Nurse Nighttime Communication and Parents' Hospital Experience. *Pediatrics*. 2015;136(5):e1249-e1258. doi:10.1542/peds.2015-2391
19. Kristensson-Hallström I. Parental Participation in Pediatric Surgical Care. *AORN Journal*. 2000;71(5):1021-1029. doi:10.1016/S0001-2092(06)61551-2
20. Levetown M, and the Committee on Bioethics. Communicating With Children and Families: From Everyday Interactions to Skill in Conveying Distressing Information. *Pediatrics*. 2008;121(5):e1441-e1460. doi:10.1542/peds.2008-0565
21. Harolds JA. Quality and Safety in Health Care, Part III: To Err is Human. *Clinical Nuclear Medicine*. 2015;40(10):793-795. doi:10.1097/RLU.0000000000000878

22. Bynum WE, Artino AR, Uijtdehaage S, Webb AMB, Varpio L. Sentinel Emotional Events: The Nature, Triggers, and Effects of Shame Experiences in Medical Residents. *Academic Medicine*. 2019;94(1):85-93. doi:10.1097/ACM.0000000000002479
23. Wu AW. Medical error: the second victim. The doctor who makes the mistake needs help too. *BMJ*. 2000;320(7237):726-727.
24. Bynum WE, W. Teunissen P, Varpio L. In the "Shadow of Shame": A Phenomenological Exploration of the Nature of Shame Experiences in Medical Students. *Academic Medicine*. 2021;96(11S):S23-S30. doi:10.1097/ACM.0000000000004261
25. Mazor KM, Fischer MA, Haley HL, Hatem D, Quirk ME. Teaching and medical errors: Primary care preceptors' views. *Medical Education*. 2005;39(10):982-990. doi:10.1111/j.1365-2929.2005.02262.x
26. Pekrun R. The Control-Value Theory of Achievement Emotions: Assumptions, Corollaries, and Implications for Educational Research and Practice. *Educ Psychol Rev*. 2006;18(4):315-341. doi:10.1007/s10648-006-9029-9
27. Scott SD, Hirschinger LE, Cox KR. Sharing the load. Rescuing the healer after trauma. *RN*. 2008;71(12):38-40, 42-43.
28. Mak-van Der Vossen M. 'Failure to fail': the teacher's dilemma revisited. *Medical Education*. 2019;53(2):108-110. doi:10.1111/medu.13772
29. Dudek NL, Marks MB, Regehr G. Failure to Fail: The Perspectives of Clinical Supervisors: *Academic Medicine*. 2005;80(Supplement):S84-S87. doi:10.1097/00001888-200510001-00023
30. Detsky AS. The Art of Pimping. *JAMA*. 2009;301(13):1379. doi:10.1001/jama.2009.247
31. Slavin SJ, Schindler DL, Chibnall JT. Medical Student Mental Health 3.0: Improving Student Wellness Through Curricular Changes. *Academic Medicine*. 2014;89(4):573-577. doi:10.1097/ACM.0000000000000166
32. McClintock AH, Fainstad TL, Jauregui J. Creating Psychological Safety in the Learning Environment: Straightforward Answers to a Longstanding Challenge. *Academic Medicine*. 2021;96(11S):S208-S209. doi:10.1097/ACM.0000000000004319
33. Bynum WE, Goodie JL. Shame, guilt, and the medical learner: ignored connections and why we should care. *Med Educ*. 2014;48(11):1045-1054. doi:10.1111/medu.12521
34. Bynum WE, Varpio L, Teunissen P. Why impaired wellness may be inevitable in medicine, and why that may not be a bad thing. *Medical Education*. 2021;55(1):16-22. doi:10.1111/medu.14284
35. Mata DA, Ramos MA, Bansal N, et al. Prevalence of Depression and Depressive Symptoms Among Resident Physicians: A Systematic Review and Meta-analysis. *JAMA*. 2015;314(22):2373. doi:10.1001/jama.2015.15845
36. Kemper KJ, Schwartz A, Wilson PM, et al. Burnout in Pediatric Residents: Three Years of National Survey Data. *Pediatrics*. 2020;145(1):e20191030. doi:10.1542/peds.2019-1030
37. Gold MA, Rosenthal SL, Wainberg ML. Walking on Eggshells With Trainees in the Clinical Learning Environment—Avoiding the Eggshells Is Not the Answer. *JAMA Pediatr*. 2019;173(10):907. doi:10.1001/jamapediatrics.2019.2501
38. Telio S, Ajjawi R, Regehr G. The "Educational Alliance" as a Framework for Reconceptualizing Feedback in Medical Education. *Academic Medicine*. 2015;90(5):609-614. doi:10.1097/ACM.0000000000000560



6

Trainees' perceptions of being allowed to fail in clinical training: A sense-making model

Published as
Klasen JM, Teunissen PW, Driessen E, Lingard LA.
Trainees' perceptions of being allowed to fail in clinical training: A sense-making model.
Med Educ. 2022 Nov 4.

Abstract

Introduction
Clinical supervisors allow trainees to fail during clinical situations when trainee learning outweighs concerns for patient safety. Trainees perceive failure as both educationally valuable and emotionally draining; however, the nuance of supervised failures has not been researched from the trainee perspective. This study explored trainees' awareness and their experience of failure and allowed failure to understand these events in-depth.

Methods
We interviewed 15 postgraduate trainees from 9 teaching sites in Europe and Canada. Participants were a purposive sample, representing 1-10 years of clinical training in various specialties. Consistent with constructivist grounded theory, data collection and analysis were iterative, supporting theoretical sampling to explore themes.

Results
Trainees reported that failure was a common, valuable, and emotional experience. They perceived that supervisors allowed failure, but they reported never having it explicitly confirmed or discussed. Therefore, trainees tried to make sense of these events on their own. If they interpreted a failure as allowed by the supervisor, trainees sought to ascertain supervisory intentions. They described situations where they judged supervisor's intentions to be constructive or destructive.

Discussion
Our results confirm that trainees perceive their failures as valuable learning opportunities. In the absence of explicit conversations with supervisors, trainees tried to make sense of failures themselves. When trainees judge that they have been allowed to fail, their interpretation of the event is colored by their attribution of supervisor intentions. Perceived intentions might impact the educational benefit of the experience. In order to support trainees' sense-making, we suggest that supervisory conversations during and after failure events should use more explicit language to discuss failures and explain supervisory intentions.

Introduction

Clinical workplace-based training is designed to put trainees at the limits of their competence to refine their abilities.[1–3] Supervisors work to balance patient safety and trainee learning,[4–7] so that both goals can be achieved. Complicating this balance, however, is the reality of trainee failure. Working at the edge of their abilities, trainees will inevitably fail. Trainee failure has implications for patient care: it may lead to negligible effects on patients, or carry risk for serious harm.[8,9] The literature reports trainee failure due to lack of experience in a broad range of different clinical situations, potentially endangering patient safety.[10–16] Failure also has implications for trainees: it can promote learning,[10–16] but it can also trigger sentinel emotional events.[17–19] A recent review reported that direct study of allowed failure in healthcare has been limited,[20] but related work has established how and what residents learn from the clinical errors they make,[11,15,10,21] the ongoing impact of residents' errors on their behavior and well-being, and the importance of failure for developing recovery strategies.[13,22]

Clinical supervision is essential to balancing the risks and benefits of trainee failures. With a trusting relationship between supervisor and trainee, trainees are more likely to admit their failures and supervisors are more likely to give trainees the autonomy they need to stretch themselves.[23–25] How supervisors respond to trainee failures can either mitigate or intensify emotional consequences such as guilt and shame,[12,17] and has implications for progression, as supervisors judge whether to entrust the trainee in the current, and future, clinical situations. Such judgements are a dynamic supervisory process[26,27] that requires evidence not only that the trainee is competent to perform independently, but also that they have an awareness of their own limits and a likelihood of asking for help when they need it.[6,26,28–30] In addition to such trainee dependent factors shaping entrustment decisions, other factors such as contextual circumstances and the acquaintance and relationship of the supervisor and the trainee also play a critical role.[23–26,26,31]

Into this rich scholarly conversation about trainee failure, clinical supervision, and entrustment decisions, recent studies added the insight that supervisors sometimes strategically allow failure when they judge that it would support training learning.[32,33] Based on interviews with clinical supervisors, the phenomenon of allowing failure was defined as a situation in which, "while supervising a trainee's clinical performance, the supervisor, influenced by both intuition and a non-linear interplay of different factors, detects an imminent trainee mistake, has the opportunity to intervene but chooses not to do so,

because the educational gain for the trainee is perceived to outweigh the (potential) consequences for the patient."[32,33] This exploration of allowing supervisors decide to allow failure suggested a complex balancing act in which they weigh threats to patient safety against benefits to trainee learning, seeking to minimize the former and maximize the latter.[33] What remains unknown is trainees' perceptions of allowed failure for learning. Therefore, this study aimed to explore whether trainees understand that supervisors allow them to fail, and how they experience such situations. Integrating trainee perspectives is necessary to refine our understanding of this educational phenomenon, and to support critical discussion of this supervisory strategy in the medical education community.

Methods

Design

Because we view allowing failure as social interaction, we used constructivist grounded theory methodology.[34] After Charmaz, our work was informed by sensitizing concepts, "those background ideas that inform the overall research problem" in a constructivist approach.[35] Sensitizing concepts derived from our previous research influenced data collection and analysis. In particular, the supervisory decision model of when, why and how to allow failure and the factors considered by supervisors provided a starting point for building analysis and offered us a preliminary way of seeing, organizing, and understanding our recent participants' experiences.[32,33] At the same time, however, we upheld the central grounded theory principle of attending to inductively identified themes; our analysis did not seek to confirm this preliminary conceptualization but rather to elaborate, refine and, as necessary, challenge it.[36,37] Swissethics (EKOS) waived the need for a detailed ethics approval (Req-2018-00437), while the human research ethics of the Western University, Canada (WesternREM) approved the study. The exploration adhered to the tenets of the Declaration of Helsinki.

Sampling strategy, setting and data collection

Given the potentially sensitive nature of the research questions, we conducted individual interviews.[38] The interview protocol was designed with two anticipated challenges in mind: trainees' reluctance to discuss failures generally and their lack of awareness of allowed failure specifically. To ease in and build rapport,[39] the interview protocol began with questions about learning from failure in their personal lives before asking about learning from failure in clinical training.

The first three interviews demonstrated that participants felt more comfortable talking about professional failure than expected, so we dropped the easing-in questions regarding failure in their personal lives. After asking about their experiences of learning from clinical failure, we presented participants with scenarios of allowing failure in clinical training as a clinical vignette; this strategy was intended to deepen the interview conversations in the case that participants were not familiar or confident enough to talk about allowing failure in their own clinical training.[40,41] Each participant considered two vignettes emerged from our previous interview study with supervisors:[42] two examples from a surgical supervisor were presented to surgical participants (including general surgery, pediatric surgery, orthopedic surgery, urology) and two examples from two internal medicine specialists were presented to participants from other specialties (including internal medicine, anesthesia, intensive care). We pilot tested the interview guide with two residents (P1, P2), which we included in the dataset because of the richness of their perceptions. Vignettes are available in the appendix (Table 1 Clinical vignettes for study participants).

We recruited participants from a range of clinical specialties in different countries, guided by a combined purposeful and convenient selection strategy. We began interviewing senior trainees because we imagined they might view the issue of allowed failure from the perspectives of both being supervised and providing supervision to more junior team members. Early interviews were conducted with surgical trainees, as JK's surgical training experiences supported rapport-building with these participants. As sampling continued, we expanded to include trainees in various training years and different specialties. In general, we expected that awareness and experience of allowed failure might vary according to the specialty culture and the nature of supervisory relationships in a specialty, such as close observation of technical performance in surgery; therefore we included surgery, gynecology, urology, pediatrics and pediatric surgery, anesthesiology and intensive-care, and internal medicine.[43] Late in the sampling, we purposively selected participants with formal medical education training (e.g., Ph.D. candidate of Medical Education) to explore how such expertise might influence perceptions. In the end, we had recruited 17 participants, but reached sampling sufficiency[44] with 15 interviews, including trainees with 2-10 years training experience from Switzerland, Germany, U.K. and Canada.

JK knew most of the participants before the interview but did not have a current hierarchical relationship with the trainees in order to avoid professional conflict. She invited possible participants via personal request (message or in person) to a voluntary interview. With the invitation to the study, JK sent a brief introduction

Table 1: Clinical vignettes for study participants[32,33]

For trainees, who worked at the emergency department, intensive care unit, on the ward of internal medicine or in general practice:	1. "By purpose I don't tell them which values they shall have looked at in the laboratory exam and I just let them do it. Sometimes they miss one of the values which are relevant and afterwards I ask them why they didn't do it. And I tell them why they should have done it and why they should do it again and there have been situations where we had to do a second puncture." (Supervisor 19) 2. "It was on a patient on Warfarin who needed vitamin K to correct the prothrombin time and we just wanted to correct it a little bit and she said, I'll give the patient 10 milligrams of Konakion, and I knew it would be much too much but I said, okay, keep going. And the next day, yeah, the prothrombin time was somewhere sky high where we didn't want it to be, and I said, well, what do you think? And she said, we gave too much Konakion, and that was no problem for the patient, we could correct it a few days later and we were not in a rush. But then I just thought, yeah, she has to learn how to do deal with doses of Konakion, of medication, and just do that, let her do it." (Supervisor 3)
For trainees, who work in the operation room (general surgery, urology, traumatology, orthopedics):	1. "If I have a young patient and he has appendicitis and we do the appendectomy and I see he will now just cut the artery, he didn›t coagulate enough very probably, but it›s not a 5-year-old child but, I don›t know, 18 and he can tolerate 150 ml of blood loss and cleaning the camera and everything. I would probably retract the camera a little bit so hopefully it doesn›t get all bloody, but if it›s not the first where I would have to say, you have to coagulate more, I would probably let this happen to have that, ahh this was not enough." (Supervisor 5) 2. "Or, for example, I remember I had a patient where I put in the trocars and I said, be sure to take care of the epigastric vessels, and I saw he didn›t, but I knew, okay I can put an endo close and it›s going to … I mean, the patient was in pain afterward, but he was good because he was on this station and the resident had really (vocalises a sharp indrawing of breath) this is not good. But I knew, okay he has a hematoma, it›s not fun for the patient but he will survive it, it›s not dangerous." (Supervisor 5)

about learning from failure and the strategy of allowing failure in other educational settings. All seventeen invited individuals agreed to voluntarily participate in the study, and provided informed consent. The interviews lasted between 44 and 70 minutes, were audio-recorded and transcribed verbatim with identifying details anonymized. Thirteen interviews were conducted in English with native and non-native speakers; two were conducted in German for the participants' convenience and translated professionally afterwards.

Data analysis and Research team

As constructivist researchers, the research team acknowledges that our orientations shape the work. The international team consisted of three PhD-trained medical education researchers (PT, ED, LL) and one Ph.D. candidate (JK); two team members were clinicians with experience as both trainees and supervisors in surgery (JK) and obstetrics/gynecology (PT). We performed an analysis of the interview data iteratively and collaboratively. JK read all anonymized transcripts and developed the initial codes while sharing selected transcripts and the code book with PT, ED and LL. In regular meetings, two researchers (JK and LL) discussed the transcripts and the list of initial codes, refining and elaborating as new transcripts were added, using a constant comparative approach. This early analysis iteratively informed the interview guide and participant selection for upcoming interviews through theoretical sampling to refine insights into recurring themes. Our analysis was informed by the concepts from our previous interview study with supervisors, particularly the role of patient, trainee, supervisor, and environment factors on allowed failure. However, we emphasized the inductive identification of patterns in the trainee data.[35] JK used Quirkos software 2.3.1 for data management and creative visual representation of our evolving conceptual understandings.

Results

Three main insights were identified by our analysis. First, trainees acknowledged failure as an opportunity for learning but were challenged by strong emotions and personal distress that can accompany these experiences. Second, participants perceived that their supervisors had allowed them to fail but reflected that the allowed failure had not been made explicit. Rather, post-failure discussion with supervisors, typically focused on the mechanism and potential response, with no discussion of the supervisor's decision to allow the failure. Last, the outcome of allowed failures depended on trainees' sense-making, in that their interpretations of supervisor intentions and patient risks had a perceived impact on learning.

Failures are common and emotional learning opportunities

Participants reported that failure was a common, valuable, and emotional experience during training. Many believed "you have to learn by failure" (P10), viewing it as unavoidable. Others saw failure as valuable because "when I fail, I know my limit, and I know where I should improve". (P12) Learning from failure was perceived to be enhanced by the sense of "responsibility that every physician feels for the patient and for the mistakes they make" (P1). With responsibility, however, came difficult emotions. Trainees shared that they felt "bad and guilty and angry and …shame" (P1), "disappointed" (P5) and "anxious" (P5), "horrible" (P15), and "guilty" (P4), when it came to failure. These emotions persisted: some participants "felt bad about it for, I don't know, quite a long time. I don't know, a couple of weeks, probably, a month, yeah, a month." (P2)

When trainees reflected on what happened after a failure event, they emphasized the emotional dimension of the experience. One participant explained:

> I felt horrible. I felt like I caused this patient's death directly. And not being able to have that debrief afterwards to try to go through, okay, let's talk about it and having that frank discussion. And there's no closure during that case. So, I don't know exactly what had happened and what my role in that case was (P15).

This participant acknowledged that debriefing might have helped with the emotions, but was missing. Participants also indicated that debriefings could intensify the emotional experience if they were perceived to be handled inappropriately: "I felt like I let down the patient because I did not do what would have made sense. I felt a little, by the attending, because … he was right, but still, the manner, how he told me, was not very respectful" (P5). Trainees also shared stories of blame and shame following failure experiences: "Yeah, I felt bad about it for, I don't know, quite a long time. I don't know, a couple of weeks, probably, a month, yeah, a month. … Everybody made fun of me for weeks, and pointed their fingers, and even had an M&M conference about it, so people learned from my failure" (P2). Such experiences were felt to compound the emotional impact of the failure. Coping strategies to deal with these emotional impacts included talking to "family and friends" (P4, P5), peers, or supervisors.

Supervisory communications about failure

Supervisory conversations could be particularly important in such coping. For instance, one participant reflected surprise at how constructive their supervisor's feedback was, given that the trainee failed: "Well, the feedback was, in general, that you've got to make the mistake before you learn not to do that again… it was quite positive, which surprised me because I felt really bad about it." (P10). However, participants' reflections suggested that such supervisory conversations about failures and the potential heavy emotions are uncommon. Trainees reported that their supervisors rarely provided explicit acknowledgement that an event was a supervised failure, while they provided feedback on the mechanism and potential response to failure, but rarely the emotional experience of the trainee. When supervisors did discuss failure, their feedback was technically focused and future oriented: they talked about how to fix the failure or how to prevent it from occurring again. For instance, trainees recalled that supervisors "just [tell] me what I did wrong, and how to solve it, and how to do it better next time" (P2), or offer specific advice such as "how to do it, to find a better angle for the needle, not to give up as quickly. …." (P11) Such descriptions suggested that supervisors periodically discuss the 'what' of supervised failure, but may not explicitly address the 'why' it happened.

Recognizing failure but rarely having supervisors confirm that a failure was allowed under supervision, participants tried to make sense of such events on their own. Below, we offer a model of this sense-making process (Figure 1). In describing its features, we draw primarily from participants' reflections on their own failures, but we also incorporate participants' reflections on the failure vignettes they considered during the interview where these elaborate our understanding.

Making sense of supervised failures

Trainees described different types of supervised failure. They made a distinction between unanticipated failures that neither supervisor nor trainee saw coming and allowed failures that the supervisor anticipated and allowed to happen. For instance, trainees recalled situations where they weren't sure about being allowed to fail: "There might have, it's just that I can't remember or didn't realize it…" (P5). Other times, participants didn't recognize that they might have been allowed to fail: "I don't remember that there was a situation like this. I don't think so" (P7) or "But I can't remember a situation when my supervisor was next to me and just observing my failure" (P3).

Due to the focus of our research study, this paper focuses on allowed failure that was perceived by trainees. Trying to make sense of these allowed failures, trainees emphasized the importance of supervisory intention. Their interpretation of intention influenced their judgement of the appropriateness of allowed failure

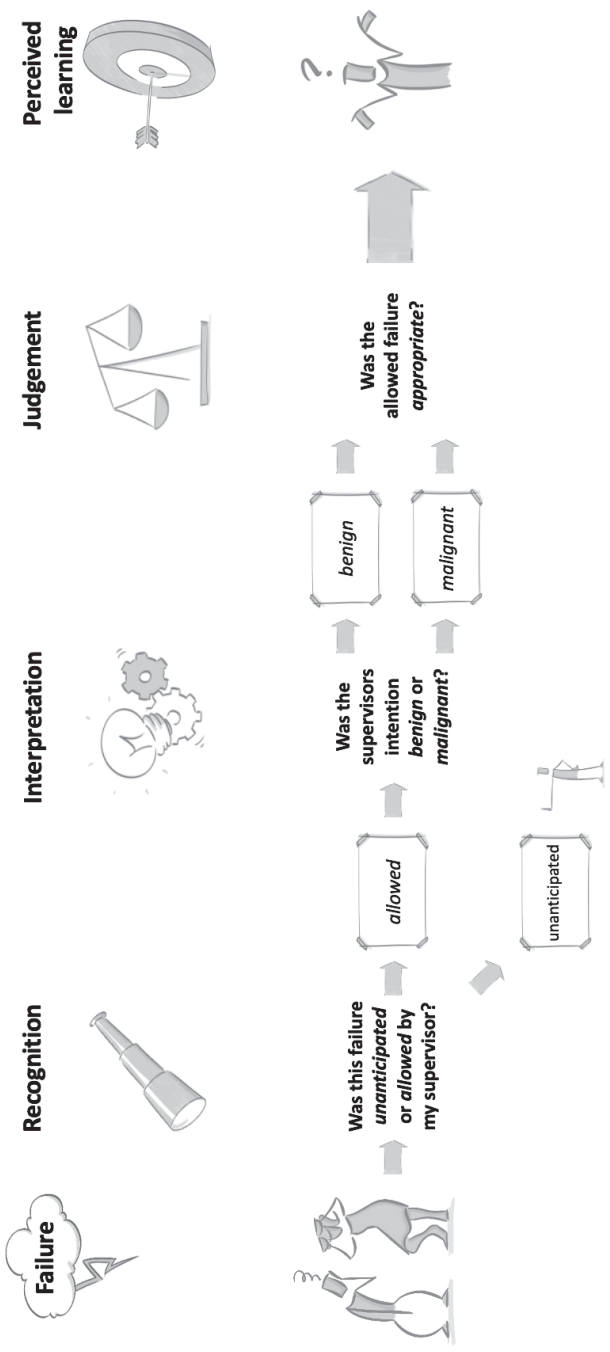


Figure 1. Conceptual sense-making model of supervised allowed failures.

as an educational strategy. It also seemed to influence what – indeed whether – trainees learned from the allowed failure.

Recognition

In general, participants recognized allowed failure as a recurring supervisory strategy. One participant suggested: "I think it happens all the time. I think, actually, it's vital (P13)", while another resident explained that "I had the feeling that I was allowed to make a mistake or not to succeed" (P11). They perceived that allowed failure was more likely in some clinical situations than others and recognized it especially in technical procedures, suggesting it as a successful teaching method:

> I think it's better to use this strategy in practical things like suturing or preparing punctions and stuff like this where you have your supervisor who can still tell you, no, no, like this, this is too dangerous. …. but maybe when you do something with your hands, it's easier for a supervisor to let you fail and then explain to you how to do it right, more than in other departments maybe. I think this sometimes happens for suturing" (P3)

Trainees were also allowed to fail in other technical procedures: "I think that was one of it was the example with the epidural anesthesia where I was allowed to fail. … Yes, in that situation, that specific situation where everything was prepared, and I was expected to fail, it wasn't a big deal" (P11). Others described patient management situations such as "making differential diagnosis with a patient … [where] the supervisor allowed me to make a failure without any bad effect on the patient" (P8). One surgical resident described it in detail why they think "… there's no other way to learn it than by doing it wrong and then you get better from it" (P2):

> Like classicals in surgery, I think. Reducing fractures, that's a good example. That's a really good way to practice this, there's no harm for the patient. And, of course, we all say at the beginning, no matter how much practice you got or how much theory you have, in real life, it's always different. There is muscle pulling the piece apart and you can't really train this, so there's no way around it. (P2)

While they offered many personal examples of allowed failure, trainees did not experience that supervisors "communicate openly about it." (P1). Our data contained no instances in which a participant reported being told by their supervisor that their failure had been allowed, yet they perceived situations

where they had been allowed to fail. In the absence of such communication, trainees were left to interpret the event on their own.

Interpretation

As participants shared their interpretations of experiences of allowed failure, they emphasized supervisory intention. Trainees perceived that intention could be constructive or destructive, and distinguished between a supervisor who has the "right motivation to offer the trainee a learning outcome… without endangering the patient" (P1) and a supervisor who "just wants me to fail. He's just looking for failure, and he just wants to tell me that I'm a failure" (P3). Their reflections suggested that they attribute the difference not to the failure itself, but to the supervisor's behavior during or following the failure, whether "they try to teach you by failure … in a nice way or in a mean way. I think this is for me more the difference [than the ethical question], how they try to teach you by failure." (P7). Another trainee described such teaching in detail and what makes the difference: "He (the supervisor) should be interested in teaching and not in humiliating the trainee, because it can release a feeling of, he just wants me to fail. He's just looking for failure, and he just wants to tell me that I'm a failure" (P3).

Most participants experienced being allowed to fail as constructively motivated by "good supervisors" (P14) who wanted trainees to learn:

> … the best trainers I've worked for have created a psychologically safe space, such that it's not only okay to fail, but also, it's okay to nearly fail. So, because you know that if you fail, there won't be blame, it will all be about learning. Because you know that they'll never really let you do anything absolutely catastrophic, there's that safety net, so that even if you do screw up, it's not going to be a screw up that's going to change things drastically. (P13)

Trainees characterized the supervisor who constructively allows failure as "reflective, confident, but still knows [their] own limits" (P1). They wondered if personality contributed to the decision to allow failure, as this resident explained:

> So, I can imagine that some supervisors, just their personality type, do not allow for failure of any sort. And other supervisors are more "skilled", I would say, quote/unquote, in knowing which situations they can let the resident do their thing without much repercussion for the patient if there's a failure. And it could be, I think, micro failures too. (P15)

Participants emphasized that such supervisors show character in providing safety both psychologically and technically to support learning.

While the predominance of examples in our data represented supervisor intentions as constructive, participants also shared stories in which they perceived a destructive supervisory intention. These moments in the interviews were emotionally charged and participants used stronger language (e.g., "bullying") then they used in talking about constructive intention. Participants interpreted destructive intention when supervisors engaged in "humiliating the trainee" (P3), and when the supervisory motivation appeared to be "laziness or indifference towards the patient…or convenience" (P1) rather than a desire to foster learning. Again, supervisor behavior signaled intention according to participants; for instance, if trainees perceived themselves to be abandoned during the failure, they interpreted destructive intention, describing such supervisors as "mean: like they led you into the situation and they don't help you out of the situation anymore" (P7). Trainees also considered supervisors' tone and language when discerning intention. A surgical resident flagged how important a respectful dialogue between failed trainee and supervisor is:

> I think it makes it worse because as soon as it gets disrespectful or personal, it's not just your skills on the line, it's yourself and your ego on the line. I think you get immediately either intimidated or defensive. I think both are very destructive traits in a working environment because it's not about your person, it's just a mistake by not thinking ahead or not knowing. It's just a very different level, I think. (P5)

This quote illustrates that feedback was seen as crucial in general, and even more after an allowed failure. The same resident explained how a supervisor should act after using the strategy of allowing failure: "… talk afterwards where they explain why they let you fail and discuss what you learned from it. I think a supervisor who uses a method like this without explaining or talking afterwards about it might be harmful" (P5). Trainees' understanding and interpretation of such events seem to depend on the supervisors' input and delivery after it.

Trainees' interpretation of supervisor intention appeared to influence the supervisor-trainee relationship. Attributions of intention seem particularly impactful on trainees' trust in their supervisors. One trainee explained that "if I feel like I can trust my trainer and that he or she trusts me, if I respect them and they treat me with respect, like a peer, like a colleague, like an adult…" (P13),

then trust was preserved in spite of the allowed failure. Some trainees also asserted that, not only was allowed failure not necessarily a threat to trust, it could strengthen it. As one explained, "if the attending feels like the situation is under control and has the trust in me that I can fix this, or that he or she can overtake in time, I think that…sounds like a good moment to learn." (P5) Allowed failure can signal "trust in" the trainees' ability to handle a situation, which can strengthen rather than erode the supervisory relationship.

Judgement

Participants saw allowed failure as common and potentially valuable and appreciated the learning opportunity: "I think in those specific incidents and specific training situations they are vital to our education. So, I think they have a high value, otherwise, it would make everything harder, and we would not be able to improve" (P12). However, they did not unequivocally accept it as best practice. Rather, they suggested that they "would not tend to use this strategy in every case" and that "there are other methods to learn" (P14).

Even when it was viewed as appropriate, allowed failure was characterized as a double-edged sword. As one surgical trainee summarized: "I think making mistakes will bring a learner much further and a lot of learning benefit. But allowing mistakes in itself is still a taboo. Doing it is a very different thing than talking about it, at least in medicine nowadays." (P1) Another admitted that "I think it's good. My supervisor allows failure, but it's got to be in a certain range" (P2). The judgement of whether an allowed failure was in the appropriate "range" included issues of patient safety and ethics. Both in relaying their own experiences and in discussing the clinical vignettes we provided, participants emphasized that allowed failure should "… not [be] endangering the patient's life and not risking serious side effects" (P2). Where patient safety was not threatened, allowed failure was viewed as acceptable because "if it doesn't really make a difference for the patient, it's probably good for the trainee to learn from because you're never going to forget that if you made a mistake" (P10).

Participants' reactions to the clinical vignettes shed light on the roles of personal context and subjectivity in trainees' judgments of the appropriateness of allowed failure for learning. For instance, the same vignette could provoke different reactions in participants. For surgical trainees familiar with bleeding during an appendectomy (P1, P10), that situation represented a "good moment to learn" (P12). Others felt differently: "I never had that situation. Interesting. I wouldn't do it with a trainee, I think. I'm sure it will be a very memorable situation for the trainee. It could also be very frustrating. Difficult. Difficult" (P8). As such reflections suggest, trainees' judgements of appropriateness were tied to whether they perceived an allowed failure as supporting or prohibiting learning.

Perceived Learning

Trainees perceived that allowed failure could have a positive learning effect, but it depended on how they understood the event. Some allowed failures were perceived as not only appropriate but necessary for learning: "… there are certain things and there's no other way to learn it than by doing it wrong and then you get better from it." (P2) The emotional dimension was also seen to promote learning: most trainees believed that allowed failures "will lead me to memorize it better… it will be fixed on your mind even more" (P1). Supervisory intention was perceived to impact learning, too: one participant described that learning depended on "if they stay nice and if they stay with you, and in the end, they say, 'okay that was not good, you should do it like this and that' and it doesn't harm the patient" (P7). As this quote illustrates, patient safety was also considered when trainees considered the potential to learn from allowed failures. Generally, trainees expressed the sentiment that "if it doesn't really make a difference for the patient, it's probably good for the trainee to learn from" (P10). However, the shared value of protecting against patient impact was in tension with the acknowledgement that failures are memorable learning events precisely because they touch patients. As one participant suggested, "I guess probably everything is a bit learned by failing, but it just depends on how big the failure is" (P10), and another posited that "the worse the consequences are for the patient, I think the better you learn from it, given that a trainee is a reflective person who sees the mistake." (P5) Learning, therefore, was a possible but not certain outcome of allowed failure, shaped by multiple factors.

Discussion

Our participants' narratives of supervised failures suggest that these experiences can have a powerful learning effect,[20,32,33] and provide support for the value of personally and professionally failing.[10,11,21] Our findings resonate with research showing that learning is intensified when patients' outcome is affected,[10,11] and that the intensity of learning through failure can have emotional consequences.[12,17]

Our findings also demonstrate that trainees are aware of the supervisory strategy of allowing failure. Participants recounted instances where they believed they had been allowed to fail; what they could not recount was having been told that their failure was allowed, or why. Absent such explicit discussions, trainees

made sense of allowed failures on their own. This study offers a model of this sense-making, the process by which participants "try to develop plausible explanations to give meaning to their experiences."[45] Sense-making matters because, when individuals commit to the meaning of an experience, it influences their further actions.[45] However, sense-making may be problematic in the absence of explicit communication. Organizational research demonstrates that the collective understanding of an experience is improved when individuals communicate,[46] while a lack of communication can create uncertainty and struggles to understand.[47,48]

Participants' sense-making involved recognizing an allowed failure event, interpreting the supervisor's intention in allowing it, and judging its appropriateness, as illustrated in our conceptual model. We offer this model as a rich description of how trainees reflect on allowed failure events, recognizing that it requires further refinement. While the model appears linear, we suspect that this arises in part from the retrospective nature of interview data. Sense-making theories have been critiqued for their linear approach to time,[49] and it is likely that real time sense-making is more iterative and nonlinear than our model suggests. This would fit with current understandings of the complex, nonlinear nature of supervisory interactions.[50] Further, sense-making is not a reflection of the event: it is subjective at all stages of the process, from recognition to perceived learning as outcome. At the recognition stage, trainees may 'misrecognize' as an allowed failure an event that the supervisor, with their greater range of experience, understands not as a failure but rather as a common source of performance variability. The impact on learning is potentially serious if the trainee understands as a mistake what the supervisor intended as an illustration of acceptable variability. At the interpretation stage of the model, as trainees read supervisor behavior, language and tone of voice, they may also 'misinterpret', forming an attribution of intention that the supervisor might not confirm. Whether or not the attribution is accurate is less important than the meaning that they make because if trainees commit to a meaning of a failed experience through their own sense-making, it will influence their actions.[45] Future research that explores sense-making 'in the moment' using observational field research methods instead of interview data could develop this sense-making model further and also uncover mid- or even long-term effect of such experiences.

From our analysis, we would contend that sense-making influences whether the allowed failure experience is understood to be productive or problematic by the trainee. This understanding shapes whether – and what – learning trainees perceive from the experience. In contrast, narratives from a previous supervisory

study suggested that supervisors were mainly concerned about trainee learning and patient care.[32,33] They didn't reflect on trainees' interpretations of such events, nor did they discuss how those interpretations might impact the learning that supervisors anticipated. Therefore, we wonder whether supervisors appreciate the sense-making process trainees go through, its influence on both how the trainee views the event and whether it has the learning effect intended.

The interpretation phase of our trainees' sense-making emphasizes the question of why the supervisor allowed them to fail as a way of making meaning; this suggests that trainees may find it difficult to learn from what happened if they don't understand why it was allowed to happen. Of particular concern is trainees' attributions of destructive intention behind supervisory decisions to allow them to fail. These attributions were less common in our data, but they seemed to have particular power: these stories were evocatively told by participants who spoke passionately about their negative impacts on the learning environment, the supervisory relationship and the educational benefit. We cannot know if our participants' attributions were accurate; however, even if the attribution of destructive intent is inaccurate, the negative impact on the learning environment is no less real for the trainee perceiving this mistreatment.[51] If allowed failure is experienced as mistreatment, it becomes demoralizing. As Bynum has recognized, failures in patient care can be a trigger for a sentinel emotional event and produce shame in the trainee.[17] Such shameful reactions undermine learning and, similarly, allowed failure becomes counterproductive. Future research could explore whether attributions of destructive intentions or perceived mistreatment are more likely in particular circumstances: for instance, when a trainee is new in their placement or a member of a group experiencing systemic inequities.[52–54]

How can we harvest the educational benefits of allowed failure while ensuring that we avoid trainee mistreatment? We need to start discussing these experiences explicitly and holistically, both in terms of acknowledging the existence of allowed failures and debriefing them. In terms of explicit acknowledgment, both this study and earlier research with supervisors suggest that trainees are not being told that they have been allowed to fail.[32,33] This silence is problematic, because we know that experiential learning is strengthened when explicit conversations take place between supervisors and trainees.[55,56] Without acknowledgement, trainees are left to recognize allowed failure for themselves, and to interpret the supervisor's intent. This may threaten the mutual trust between trainees and supervisors, which is fostered by open and honest learning conversations.[23] In terms of debriefing, our results suggest that supervisors

currently approach debriefing conversations in a technical manner focused on solution and prevention. This narrow focus should be expanded to include the emotions of experienced failure as this seems to be a crucial component of perceived learning. While we appreciate that constructive learning conversations are hard to achieve, and open discussions of actual errors have been reported to be particularly problematic.[10]

We suggest that supervisors acknowledge when they have allowed a trainee to fail; explain why they used this supervisory strategy; debrief the failure; and explore its impact on learning, emotions, and the supervisory relationship. Given trainees' concerns about patient safety in their discussion of clinical vignettes, we also recommend that supervisors make visible their risk/benefit analysis that led them to judge the allowed failure appropriate. Whether or not this supervisory strategy achieves its potential educational benefit depends on the presence, quality and precision of these explicit and constructive learning conversations.[57]

Limitations

Two features of our study design – our data collection method and our sampling strategy – constrain our findings and the transferability of our insights. The individual interview method highlights trainees' perceptions and interpretations. It offers access to trainees' interpretation of allowed failure experiences and their sense of the learning that is possible from them. However, it also lends itself to retrospective and linear expressions of sense-making which will not fully represent the complex, nonlinear and socially constructed nature of the real time experience of workplace-based learning.[49] Future research employing observational methods to study trainees and supervisors interacting in their environment could refine these insights. We chose to sample broadly, which is common in CGT research where the aim is to explain a social phenomenon at a conceptual level. However, our results suggest that context matters –e.g., trainees viewed an allowed failure as appropriate in some situations but not in others, particularly when engaging with vignettes. Further, our sampling strategy didn't represent a specific postgraduate training program type; therefore, it was unclear if trainees worked in settings with a workplace-based assessment based on entrustment,[58] and if they had regular supervisor-trainee meetings to discuss trainee learning progress against stated learning outcomes. Sampling across contexts limits our ability to appreciate the influence of contextual features, such as postgraduate program formative assessment practices and learning culture

of the institutions systematically. Future work could sample more robustly in select workplace learning contexts in order to enrich our understanding of how particular contextual features influence what is recognized as an allowed failure, how it is interpreted, whether it is judged appropriate, and how learning is affected. Finally, while interview research with international participants offers a rich dataset, it is complicated by nuances of language, particularly in a study like ours where nuanced distinctions (such as between the terms failure, mistake, and error) which cannot be readily solved through translation.[59,60]

Conclusion

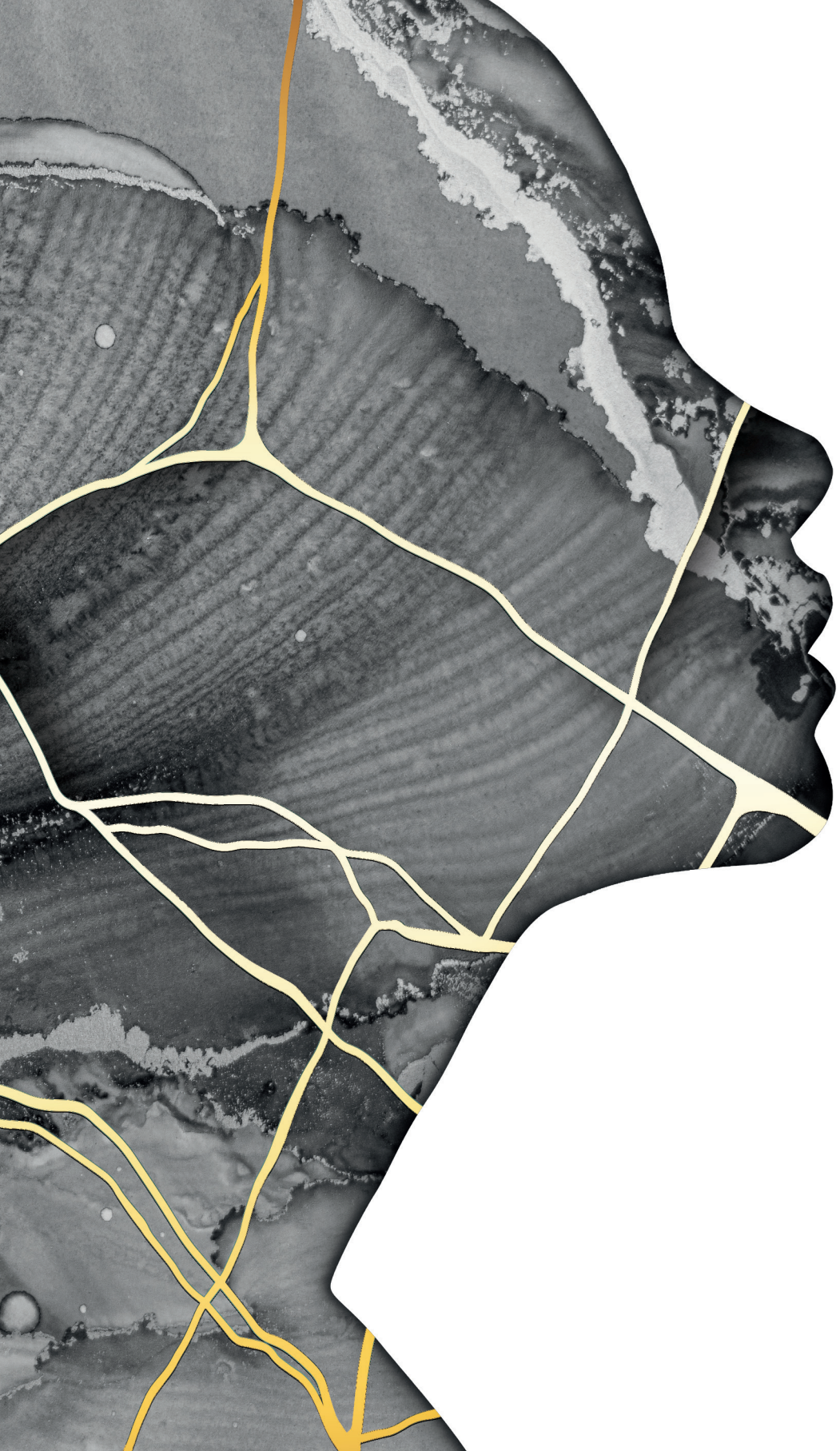
Trainees recognize that their supervisors sometimes allow them to fail. They view these failures as potentially valuable for learning, but whether that potential is achieved depends on how they understand the experience. The silence about allowing failure and the narrow, technical nature of debriefings following allowed failure leaves trainees alone in their sense-making about issues such as why a failure was allowed and whether it was an appropriate balance of patient risk and trainee benefit. Supervisors should elaborate their conversations with trainees when they allow them to fail to give them the chance to realize the intended educational benefit of the experience.

References

1. Ramani S, Leinster S. AMEE Guide no. 34: teaching in the clinical environment. Medical Teacher. 2008 Jan;30(4):347–64.
2. Crockett C, Joshi C, Rosenbaum M, Suneja M. Learning to drive: resident physicians' perceptions of how attending physicians promote and undermine autonomy. BMC Med Educ. 2019 Dec;19(1):293.
3. Hashimoto DA, Bynum WE, Lillemoe KD, Sachdeva AK. See More, Do More, Teach More: Surgical Resident Autonomy and the Transition to Independent Practice. Academic Medicine. 2016 Jun;91(6):757–60.
4. Farnan JM, Johnson JK, Meltzer DO, Harris I, Humphrey HJ, Schwartz A, et al. Strategies for Effective On-Call Supervision for Internal Medicine Residents: The Superb/Safety Model. Journal of Graduate Medical Education. 2010 Mar;2(1):46–52.
5. Farnan JM, Petty LA, Georgitis E, Martin S, Chiu E, Prochaska M, et al. A Systematic Review: The Effect of Clinical Supervision on Patient and Residency Education Outcomes. Academic Medicine. 2012 Apr;87(4):428–42.
6. Kennedy TJT. Towards a tighter link between supervision and trainee ability. Medical Education. 2009 Dec;43(12):1126–8.
7. Kilminster S, Cottrell D, Grant J, Jolly B. AMEE Guide No. 27: Effective educational and clinical supervision. Med Teach. 2007 Feb;29(1):2–19.
8. Finn KM, Metlay JP, Chang Y, Nagarur A, Yang S, Landrigan CP, et al. Effect of Increased Inpatient Attending Physician Supervision on Medical Errors, Patient Safety, and Resident Education: A Randomized Clinical Trial. JAMA Intern Med. 2018 Jul 1;178(7):952.
9. Landrigan CP, Rahman SA, Sullivan JP, Vittinghoff E, Barger LK, Sanderson AL, et al. Effect on Patient Safety of a Resident Physician Schedule without 24-Hour Shifts. N Engl J Med. 2020 Jun 25;382(26):2514–23.
10. Fischer MA, Mazor KM, Baril J, Alper E, DeMarco D, Pugnaire M. Learning from mistakes: Factors that influence how students and residents learn from medical errors. Journal of General Internal Medicine. 2006;21(5):419–23.
11. Wu AW, Folkman S, McPhee SJ, Lo B. Do house officers learn from their mistakes? JAMA. 1991 Apr 24;265(16):2089–94.
12. Shepherd L, LaDonna KA, Cristancho SM, Chahine S. How Medical Error Shapes Physicians' Perceptions of Learning: An Exploratory Study. Academic Medicine. 2019 Apr;1.
13. Kroll L, Singleton A, Collier J, Rees Jones I. Learning not to take it seriously: junior doctors' accounts of error. Medical Education. 2008 Oct;42(10):982–90.
14. Walling HW, Veremakis C. Ordering errors by first-year residents: evidence of learning from mistakes. Mo Med. 2004 Apr;101(2):128–31.
15. Walsh KE, Miller MR, Vinci RJ, Bauchner H. Pediatric Resident Education About Medical Errors. Ambulatory Pediatrics. 2004 Nov;4(6):514–7.
16. Engel KG, Rosenthal M, Sutcliffe KM. Residents?? Responses to Medical Error: Coping, Learning, and Change. Academic Medicine. 2006;81(1):86–93.
17. Bynum WE, Artino AR, Uijtdehaage S, Webb AMB, Varpio L. Sentinel Emotional Events: The Nature, Triggers, and Effects of Shame Experiences in Medical Residents. Academic Medicine. 2019 Jan;94(1):85–93.
18. Wu AW. Medical error: the second victim. The doctor who makes the mistake needs help too. BMJ. 2000 Mar 18;320(7237):726–7.
19. Vohra PD, Johnson JK, Daugherty CK, Wen M, Barach P. Housestaff and Medical Student Attitudes Toward Medical Errors and Adverse Events. The Joint Commission Journal on Quality and Patient Safety. 2007 Aug;33(8):493–501.
20. Klasen JM, Lingard LA. Allowing failure for educational purposes in postgraduate clinical training: A narrative review. Medical Teacher. 2019 Jul 7;1–7.
21. Bradley CK, Fischer MA, Walsh KE. Trends in medical error education: Are we failing our residents? Academic Pediatrics. 2013;13(1):59–64.

22. Scott SD, Hirschinger LE, Cox KR, McCoig M, Brandt J, Hall LW. The natural history of recovery for the healthcare provider "second victim" after adverse patient events. Quality and Safety in Health Care. 2009;18(5):325–30.
23. Gin BC, Tsoi S, Sheu L, Hauer KE. How supervisor trust affects early residents' learning and patient care: A qualitative study. Perspect Med Educ. 2021 Dec;10(6):327–33.
24. Sheu L, Kogan JR, Hauer KE. How Supervisor Experience Influences Trust, Supervision, and Trainee Learning: A Qualitative Study. Academic Medicine. 2017 Sep;92(9):1320–7.
25. Hauer KE, ten Cate O, Boscardin C, Irby DM, Iobst W, O'Sullivan PS. Understanding trust as an essential element of trainee supervision and learning in the workplace. Adv in Health Sci Educ [Internet]. 2013 Jul 27 [cited 2022 Mar 2]; Available from: http://link.springer.com/10.1007/s10459-013-9474-4
26. ten Cate O, Hart D, Ankel F, Busari J, Englander R, Glasgow N, et al. Entrustment Decision Making in Clinical Training: Academic Medicine. 2016 Feb;91(2):191–8.
27. ten Cate O, Chen HC. The ingredients of a rich entrustment decision. Medical Teacher. 2020 Dec 1;42(12):1413–20.
28. Ten Cate O, Billett S. Competency-based medical education: Origins, perspectives and potentialities. Medical Education. 2014;48(3):325–32.
29. Kennedy TJT, Lingard L, Baker GR, Kitchen L, Regehr G. Clinical Oversight: Conceptualizing the Relationship Between Supervision and Safety. Journal of General Internal Medicine. 2007 Jul 5;22(8):1080–5.
30. Kennedy TJT, Regehr G, Baker GR, Lingard LA. 'It's a cultural expectation…' The pressure on medical trainees to work independently in clinical practice. Medical Education. 2009 Jul;43(7):645–53.
31. Cate O ten. Trust, competence, and the supervisor's role in postgraduate training. BMJ. 2006 Oct 7;333(7571):748–51.
32. Klasen JM, Driessen E, Teunissen PW, Lingard LA. 'Whatever you cut, I can fix it': clinical supervisors' interview accounts of allowing trainee failure while guarding patient safety. BMJ Qual Saf. 2020 Sep;29(9):727–34.
33. Klasen JM, Teunissen PW, Driessen EW, Lingard LA. 'It depends': The complexity of allowing residents to fail from the perspective of clinical supervisors. Medical Teacher. 2021 Oct 11;1–10.
34. Charmaz K. Constructing grounded theory. London ; Thousand Oaks, Calif: Sage Publications; 2006. 208 p.
35. Bowen GA. Grounded Theory and Sensitizing Concepts. International Journal of Qualitative Methods. 2006 Sep;5(3):12–23.
36. Tavakol M, Torabi S, Akbar Zeinaloo A. Grounded Theory in Medical Education Research. Medical Education Online. 2006 Dec;11(1):4607.
37. Watling CJ, Lingard L. Grounded theory in medical education research: AMEE Guide No. 70. Medical Teacher. 2012 Oct;34(10):850–61.
38. DiCicco-Bloom B, Crabtree BF. The qualitative research interview. Med Educ. 2006 Apr;40(4):314–21.
39. Prior MT. Accomplishing "rapport" in qualitative research interviews: Empathic moments in interaction. Applied Linguistics Review. 2018 Oct 25;9(4):487–511.
40. Törrönen J. Using vignettes in qualitative interviews as clues, microcosms or provokers. QRJ. 2018 Jul 25;18(3):276–86.
41. Jenkins N, Bloor M, Fischer J, Berney L, Neale J. Putting it in context: the use of vignettes in qualitative interviewing. Qualitative Research. 2010 Apr;10(2):175–98.
42. Sampson H, Johannessen IA. Turning on the tap: the benefits of using 'real-life' vignettes in qualitative research interviews. Qualitative Research. 2020 Feb;20(1):56–72.
43. Watling C, Cristancho S, Wright S, Varpio L. Necessary Groundwork: Planning a Strong Grounded Theory Study. Journal of Graduate Medical Education. 2017 Feb 1;9(1):129–30.
44. LaDonna KA, Artino AR, Balmer DF. Beyond the Guise of Saturation: Rigor and Qualitative Interview Data. Journal of Graduate Medical Education. 2021 Oct 1;13(5):607–11.
45. Kramer MW. Sensemaking. In: Scott CR, Barker JR, Kuhn T, Keyton J, Turner PK, Lewis LK, editors. The International Encyclopedia of Organizational Communication [Internet]. 1st ed.

Wiley; 2016 [cited 2022 Mar 2]. p. 1–10. Available from: https://onlinelibrary.wiley.com/doi/10.1002/9781118955567.wbieoc185
46. Fenwick T. Understanding Relations of Individual—Collective Learning in Work: A Review of Research. Management Learning. 2008 Jul;39(3):227–43.
47. Ilgen JS, de Bruin ABH, Teunissen PW, Sherbino J, Regehr G. Supported Independence: The Role of Supervision to Help Trainees Manage Uncertainty. Academic Medicine. 2021 Nov;96(11S):S81–6.
48. Ilgen JS, Regehr G, Teunissen PW, Sherbino J, Bruin ABH. Skeptical self□regulation: Resident experiences of uncertainty about uncertainty. Med Educ. 2021 Jun;55(6):749–57.
49. Dawson P, Sykes C. Concepts of Time and Temporality in the Storytelling and Sensemaking Literatures: A Review and Critique. International Journal of Management Reviews. 2019 Jan;21(1):97–114.
50. Klasen JM, Lingard LA. The butterfly effect in clinical supervision. Perspect Med Educ. 2021 Mar 22;s40037-021-00659–8.
51. Leisy HB, Ahmad M. Altering workplace attitudes for resident education (A.W.A.R.E.): discovering solutions for medical resident bullying through literature review. BMC Med Educ. 2016 Dec;16(1):127.
52. Umoetok F, Van Wyk JM, Madiba TE. Does gender impact on female doctors'experiences in the training and practice of surgery? A single centre study. S Afr J Surg. 2017 Sep;55(3):8–12.
53. Myers SP, Hill KA, Nicholson KJ, Neal MD, Hamm ME, Switzer GE, et al. A qualitative study of gender differences in the experiences of general surgery trainees. J Surg Res. 2018 Aug;228:127–34.
54. Liang R, Dornan T, Nestel D. Why do women leave surgical training? A qualitative and feminist study. Lancet. 2019 Feb 9;393(10171):541–9.
55. Yardley S, Teunissen PW, Dornan T. Experiential learning: Transforming theory into practice. Medical Teacher. 2012 Feb;34(2):161–4.
56. Yardley S, Teunissen PW, Dornan T. Experiential learning: AMEE Guide No. 63. Medical Teacher. 2012 Feb;34(2):e102–15.
57. Teunissen PW, Atherley A, Cleland JJ, Holmboe E, Hu WCY, Durning SJ, et al. Advancing the science of health professions education through a shared understanding of terminology: a content analysis of terms for "faculty." Perspect Med Educ [Internet]. 2021 Sep 10 [cited 2021 Nov 18]; Available from: https://link.springer.com/10.1007/s40037-021-00683-8
58. Rekman J, Gofton W, Dudek N, Gofton T, Hamstra SJ. Entrustability Scales: Outlining Their Usefulness for Competency-Based Clinical Assessment. Academic Medicine. 2016 Feb;91(2):186–90.
59. Helmich E, Cristancho S, Diachun L, Lingard L. 'How would you call this in English?': Being reflective about translations in international, cross-cultural qualitative research. Perspect Med Educ. 2017 Apr;6(2):127–32.
60. Lingard L. Language matters: towards an understanding of silence and humour in medical education: Language matters. Medical Education. 2013 Jan;47(1):40–8.



7

"The butterfly effect in clinical supervision"

Published as
Klasen JM, Lingard LA.
The butterfly effect in clinical supervision.
Perspect Med Educ. 2021 Jun;10(3):145-147.

«What does the flap of a butterfly's wing look like in clinical supervision?»

The butterfly effect is a well-known metaphor for the idea that complex, dynamic, non-linear systems produce unpredictable effects due to the profound influence of tiny variations.[1] Many things in medical education may tacitly make an assumption of linearity, such as the way we talk about the progression of a trainee from incompetence to competence or the graded autonomy supervisors allow trainees over the course of this progression.[2–6] However, we also recognize that linear assumptions don't always hold in our field.[7] To understand complex work-based training phenomena like supervision and entrustment, we need to acknowledge that the interactions among clinicians, trainees and patients are nonlinear[7] This intersection, this tension between linear and nonlinear assumptions, is a tricky space to inhabit as educators and as researchers. But we must, if we are to develop robust understandings of how supervision and entrustment work in practice.

Gilchrist et al.'s multiple case study of supervisory dyads offers us a glimpse of this intersection.[8] The group explored how supervisory behaviours related to their judgements of trainee competence. They acknowledge that clinical supervision is a "dynamic activity", and that "what appears to be a linear path towards an entrustment decision, may actually represent a complex interaction of factors" (p6). At the same time, they conceptualize the activity under study in a linear manner: a trigger produces a supervisory behavior, which shapes a competence judgment which impacts future supervisory behavior. This linear conceptualization is reflected in the systematic approach by which the analysis sought "to organize the information pertaining to each incident by parsing it into information that described the supervisory behaviour, the trigger of the supervisory behaviour, why the attending responded to that particular situation with that particular supervisory behaviour, how the incident informed their judgment of trainee competence, and any impact on subsequent supervision" (p11).

We are not arguing against this analytical approach. There is an elegant logic to it. The study offers an impressive dataset of 10 cases, 51 interview transcripts and 25 sets of daily field notes, which yielded 1-7 supervisory incidents per case for a total of 37 incidents within each case. A rich description of trainee and non-trainee triggers, supervisory behaviors and competence judgments helps to advance our understanding of supervisory practices in the clinical workplace. But, perhaps a bit ironically, one of the main findings is that there is "not a consistent relationship between the trigger for supervision, the supervisor's

competence judgment of the trainee, and the supervisory behaviour, both within the (presented) dyads and across dyads" in the study (p20).

It may be that we feel this irony because we've inhabited this same space as researchers. Our research explores the supervisory strategy of allowing failure in clinical training asking supervisors about situations in which they allowed trainees to fail for educational purposes.[9] Supervisors reported that their decisions to allow failure were intuitive, made in the moment, and perhaps even unconscious. Reflecting on these decisions afterwards, they realized a complex set of patient, trainees, supervisor and environmental factors interacting to produce these intuitive decisions. These factors sounded linear, particularly the recurring notion that "patient factors trump all." But when we tried to model the relationships between the factors as a way of understanding why failure might be allowed in one situation but not another, we concluded that the answer was "it depends". Even patient factors were not straightforwardly linear – that is, they did not predict the decision to allow failure for learning – because they worked in combination with the other factors. Again, we come up against the tension between linearity and nonlinearity. Clinical supervisors decide to allow failure in one moment and they describe factors that explain the decision afterwards, but those factors do not seem to predict their next decision. Rather, they may decide not to allow failure the next time, even when the factors appear similar on the surface. Something has changed in the interplay of patient, trainee, supervisor and environment factors, beneath the surface of their awareness and our view as researchers. Because it is something we can't predict or articulate, it manifests itself as "it depends" in our dataset.

We are not alone in recognizing such complexity in medical education research. In fact, nonlinearity is a recurring finding from our community. We may not always be using this term, but that's what we're bumping up against. It may appear in the literature as 'it depends' research.[7] For instance, Ginsberg et al. used focus groups to explore practicing physicians' approaches to common professionalism dilemmas and found that, although participants agreed on basic guiding principles of professionalism, their reported approaches "were subject to multiple, interdependent, idiosyncratic forces unique to each situation", making their responses "difficult to predict or assess" (p1692).[10] Titling their paper "It depends: …", they concluded that professionalism should be approached as "a complex adaptive system … in which multiple interdependent factors operate simultaneously" such that even the few rules that appeared to govern responses in one situation may be broken in another (p1692).

Even as our models of clinical supervision become increasingly sophisticated, we run up against this "it depends" problem. Take two recent examples. Hauer et al.'s phenomenographic study of how supervisors judge a resident's trustworthiness for practice identified accelerators and barriers that interact to influence the evolution of trust formation.[11] And Holzhausen's conceptual framework of the entrustment decision-making process combined factors identified through empirical research in medical education with theoretical models on trust from the fields of organizational and occupational psychology, in order to support research into the rich array of variables influencing the entrustment decision-making process.[12] In both of these works, we see the crossroads of linearity and nonlinearity as researchers grapple with complex, dynamic processes. Holzhausen et al. identify "potentially important variables and their interrelatedness, with the goal of making these assumptions explicit and testable" (p123), while at the same time acknowledging that "it is not yet clear how strong the effects of various factors are" and there remain a number of "unknown influential variables in the entrustment decision making process" including "subconscious factors within the trustor", "mood", and "gut feeling" (p124). Similarly, Hauer et al. acknowledged that the process of developing trust is "complex and sometimes nebulous" (p792) and they warn that it "can involve a synthetic, holistic judgement that perhaps cannot be fragmented into milestones" (p792). Yet, their conclusion sits at the very intersection of linearity and nonlinearity, both emphasizing "the complexity and dynamically evolving nature of trust" and suggesting that "the development of trust could be standardised using trust-based ratings scales" (p793).[11]

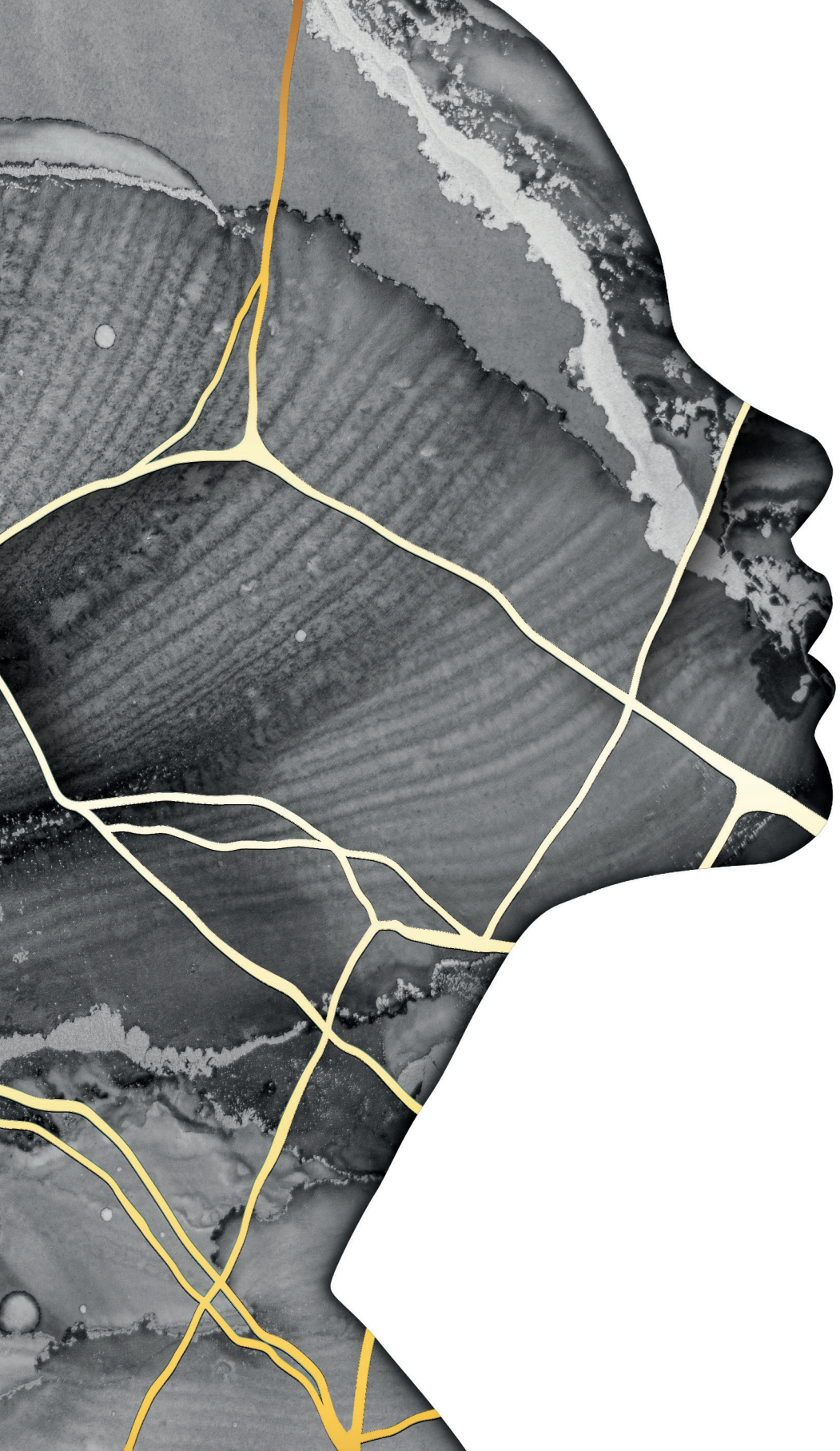
Scholars exploring the dynamic processes of clinical supervision and entrustment will perhaps always look up from their work and find themselves in the land of 'it depends', between the proverbial rock (of linearity) and the hard place (of nonlinearity). What do we do with this? Let's return to the butterfly's wing, that famous icon of chaos theory. Back in 1972, a professor at MIT asked, "*Does the flap of a butterfly's wings in Brazil set off a tornado in Texas?*" (from Edward U. Lorenz, Professor of Meteorology, Massachussetts Institute of Technology, Cambridge, 1972). The butterfly's wing is a trigger, but not in the way that Gilchrist et al conceptualize. In their work, a trigger is a visible or audible cue to which the supervisory is observed to respond in a linear fashion. The butterfly's wing, by contrast, is an invisible, inaudible trigger: it happens in Brazil, so the tornado victims in Texas *cannot* respond. We would encourage extending Gilchrist et al.'s trigger concept to include nonlinear triggers – to include butterfly's wings. This conceptualization might help us to explore supervisory responses for which there is no visible or audible cue. How do we understand

those responses? Are they trigger-less? Or are supervisors responding to invisible, inaudible cues? And if they are, are there ways for us to render those cues visible and audible – to supervisors, and to researchers?

Such questions could help us to push ourselves to deepen our exploration at the crossroads of linearity and nonlinearity. Not least, they could position us to explore the implications of nonlinearity, of "it depends" phenomenon, for both trainee learning and patient safety. If a mere flap of a butterfly's wing can change the nature of clinical supervision, then how can we guarantee optimal trainee learning and patient safety? We cannot, unless our research advances to make these small disturbances recognizable and provide a new language for talking about them. What appears as chaos, as unpredictable in any single study, may present itself as an emergent pattern if we can step back and take a wider view. We should not, however, expect that pattern to be linear. Nonlinearity may be uncomfortable for us, but we must challenge ourselves to describe these dynamic phenomena without slipping into linear assumptions.

References

1. Vernon J. Understanding the Butterfly Effect. Am Sci. 2017;105:130.
2. ten Cate O, Hart D, Ankel F, Busari J, Englander R, Glasgow N, et al. Entrustment Decision Making in Clinical Training: Academic Medicine. 2016;91:191–8.
3. Fernandez N, Dory V, Ste-Marie L-G, Chaput M, Charlin B, Boucher A. Varying conceptions of competence: an analysis of how health sciences educators define competence: Conceptions of competence. Medical Education. 2012;46:357–65.
4. Franzone JM, Kennedy BC, Merritt H, Casey JT, Austin MC, Daskivich TJ. Progressive Independence in Clinical Training: Perspectives of a National, Multispecialty Panel of Residents and Fellows. Journal of Graduate Medical Education. 2015;7:700–4.
5. Sterkenburg A, Barach P, Kalkman C, Gielen M, ten Cate O. When Do Supervising Physicians Decide to Entrust Residents With Unsupervised Tasks?: Academic Medicine. 2010;85:1408–17.
6. Kennedy TJT, Regehr G, Baker GR, Lingard LA. 'It's a cultural expectation…' The pressure on medical trainees to work independently in clinical practice. Medical Education. 2009;43:645–53.
7. Durning SJ, Lubarsky S, Torre D, Dory V, Holmboe E. Considering "Nonlinearity" Across the Continuum in Medical Education Assessment: Supporting Theory, Practice, and Future Research Directions. Journal of Continuing Education in the Health Professions. 2015;35:232–43.
8. Gilchrist T, Hatala R, Gingerich A. A collective case study of supervision and competence judgments on the inpatient internal medicine ward. Perspect Med Educ [Internet]. 2021 [cited 2021 Feb 9]; Available from: http://link.springer.com/10.1007/s40037-021-00652-1
9. Klasen JM, Driessen E, Teunissen PW, Lingard LA. 'Whatever you cut, I can fix it': clinical supervisors' interview accounts of allowing trainee failure while guarding patient safety. BMJ Qual Saf. 2019;bmjqs-2019-009808.
10. Ginsburg S, Bernabeo E, Ross KM, Holmboe ES. "It Depends": Results of a Qualitative Study Investigating How Practicing Internists Approach Professional Dilemmas. Academic Medicine. 2012;87:1685–93.
11. Hauer KE, Oza SK, Kogan JR, Stankiewicz CA, Stenfors-Hayes T, Cate OT, et al. How clinical supervisors develop trust in their trainees: a qualitative study. Med Educ. 2015;49:783–95.
12. Holzhausen Y, Maaz A, Cianciolo AT, Ten Cate O, Peters H. Applying occupational and organizational psychology theory to entrustment decision-making about trainees in health care: a conceptual model. Perspect Med Educ. 2017;6:119–26.



8

Discussion

8.1 Overview

With this doctoral thesis, I shed light on the phenomenon of allowing failure in clinical medicine and described it from different perspectives in the medical education community. In the discussion chapter that follows, I summarize the insights from each chapter and connect them to the overarching research questions, explaining how those findings contribute to the scholarly debate in medical education with its implications for supervisory practice, trainee learning and well-being, and patient safety and care. I then address how I grappled with four main issues of the research program: 1. exploring and 2. presenting the data of a sensitive research topic while 3. navigating and 4. expressing my findings in precise language. After addressing the limitations and merits of this thesis, I discuss the societal and scientific relevance as well as my ideas for future study areas, followed by some closing thoughts.

8.2 Summary of Findings

The critical, narrative literature review (Chapter 2) revealed that no literature in this particular context of clinical medicine provided evidence on the phenomenon of allowing failure and, therefore, no underlying theory about this assumed supervisory practice existed. Nevertheless, a small set of papers addressed highly related issues to our research question, such as how and what residents learn from the clinical errors they make, the ongoing impact of residents' errors on them, and the importance of failure for developing recovery strategies. These studies did not explore how to allow or optimize learning from failure in the clinical environment; however, they demonstrated that the experience of medical error is a profound one for trainees.

From this review, I gained critical insights for the development of the further research program. First, the reviewed articles employed a combination of terms, including error, failure, mistake, and mishap. I recognized that these terms are not interchangeable, and that such variety poses a challenge for consistent knowledge building around this topic. I pondered whether it would be problematic to simply merge them into a new vocabulary until the nuanced distinctions among these terms were carefully considered. Therefore, I proposed the term "allowing failure for educational purposes" as a consistent starting point for future research into this domain, but this will need to be refined as insights emerge from empirical research. Second, I theorized that the potential reason for the gap in the medical literature is that this educational approach is taboo and

formal discussion of this topic is lacking due to the preeminent importance attached to patient safety in medicine.

My first qualitative study (Chapter 3) found that clinical supervisors from different contexts and institutions admitted to allowing trainees to fail in clinical situations for educational purposes. Supervisors acknowledged the emotional impact of failure as part of its educational power and perceived it as better for trainees to fail under supervision than when they are working unsupervised. The participants also appreciated the gravity of their decisions about allowing such failure, which is both inherently risky and necessary for trainees to develop into safe practitioners.

With this first empirical data on the phenomenon of allowing failure, I defined the educational strategy and developed a preliminary definition of conditions and expectations that are reflective of the nature of supervision, the type of clinical performance, the potential for both anticipated and unexplained consequences, and the strategies that can be put in place to maximize trainee learning and avoid patient harm. The definition I offered was: "While supervising a trainee's clinical performance, the supervisor detects an imminent trainee mistake, has the opportunity to intervene but deliberately chooses not to do so because the educational gain for the trainee is perceived to outweigh the (potential) consequences for the patient". This first definition and model prepared the ground for the next study to gain a deeper understanding of the nature and scope of this practice by examining the various factors that affect clinical supervisors' judgement of when failure is sufficient to promote trainee learning but is not so great as to affect patient outcome.

Further research (Chapter 4) in the form of a constructivist grounded theory study explored the supervisory strategy of allowing failure in clinical training, asking supervisors about situations in which they allowed trainees to fail for educational purposes. Supervisors reported that their decisions to allow failure were intuitive, made in the moment, and perhaps even unconscious. However, when we tried to model the relationships between the factors as a way of understanding why failure might be allowed in one situation but not another, I concluded that the answer was "it depends". This suggested that the interplay of patient, trainee, supervisor, and environment factors is fluid and nonlinear, and that these shifts take place beneath the surface of supervisor awareness and our view as researchers. The final definition of the phenomenon from the supervisors' narratives is: "While supervising a trainee's clinical performance, the supervisor, influenced by both intuition and a non-linear interplay of different factors,

detects an imminent trainee mistake, has the opportunity to intervene but chooses not to do so, because the educational gain for the trainee is perceived to outweigh the (potential) consequences for the patient". This re-defined description of the theoretical model supported an increasing appreciation in the medical education community regarding the non-linearity of supervisory practices.

My first studies suggested that allowing failure might be differently understood in different clinical domains. To explore this further, I conducted a study of pediatric hospitalists (Chapter 5) at an institution in the US, aiming to understand pediatric hospitalists' intentions to allow trainee failure during clinical encounters. As in the multi-specialty study, almost all participants shared that they intentionally allowed failure as a teaching strategy, acknowledging its emotional power and weighing its educational benefits against harms to patients, caregivers, and trainees. Further, I described that they follow a process for allowing failure, including initiating an orientation, considering factors influencing decision-making, and debriefing with trainees, what added to the understanding of the explored phenomenon. Again, a struggle to find appropriate language was highlighted in this study, in that participants did not explicitly alert trainees to this teaching strategy, and they avoided using the term "failure" during debriefs to protect trainees from perceived potential for psychological harm associated with the term.

Knowing about the perceptions of clinical supervisors in different clinical settings from different countries (Switzerland, Canada, and the US) about allowing failure for educational purposes, weighing the educational value against patient safety, caregiver relationships, and trainee well-being, I was intrigued to learn how residents perceive this phenomenon and about the powerful relationship between emotional distress and learning from failure. The study findings (Chapter 6) suggested that trainees recognize that their supervisors sometimes allow them to fail. They viewed these failures as potentially valuable for learning, but whether that potential is achieved depended on how they understood and made sense out of this experience. Due to the lack of explicit discussion with supervisors, trainees were left alone to make sense of their failure events. When they judged that they had been allowed to fail, their interpretation of the event was colored by their attribution of supervisor intent, which raised the question of whether perceived intent might impact the educational benefit or potential harm of the experience. This sense-making influenced whether the allowed failure experience was understood to be productive or problematic by the trainee.

Based on my gained knowledge from the explorations, I explained my assumptions about non-linearity in medical education research in an invited commentary (Chapter 7) to the multiple case study of Gilchrist and colleagues. In that study, Gilchrist et al. investigated supervisory dyads, offering a glimpse of this intersection between linear and nonlinear assumptions, and showed a rich description of trainee and non-trainee triggers, supervisory behaviours, and competence judgments in order to advance our understanding of supervisory practices in the clinical workplace.[1] Picking up on the study findings of of non-linearity, I highlighted non-linearity as a recurring finding in medical education.

Using the well-known metaphor of the butterfly effect, I gained a better understanding of the supervisory responses. The butterfly effect suggests that the profound influence of tiny variations in complex, dynamic, nonlinear systems can lead to unpredictable effects. This metaphor allowed me to explore the implications of these concepts for trainee learning and patient safety, especially in situations where there are no visible or audible cues and helped me grasp the idea of non-linearity and the "it depends" phenomenon. Therefore, I suggested that research should be conducted to make these small disturbances recognizable and provide a new language for talking about them. Further, I acknowledged that nonlinearity may be uncomfortable for us, but we must nevertheless challenge ourselves to describe these dynamic phenomena without slipping into linear assumptions.

By presenting my understanding of how this research contributes to the current knowledge landscape and its potential future implications, the thesis enriches the field of study and facilitates its integration into real-world contexts, which I present in the next sections.

8.3 Current and Future Implications

This thesis contributes to the existing knowledge about learning from failure by describing supervisors' and trainees' experiences of an unspoken pedagogy of allowed failure in clinical training. It could potentially impact medical education in three main areas: implications for supervisory practice and entrustment; implications for trainee learning and well-being; and implications for patient safety and care. Each of these implications involves ethical and emotional considerations.

8.3.1 Implications for supervisory practice and entrustment

In this section, I explore the potential of allowed failure for supervision and entrustment within the clinical training context by suggesting that the pedagogy of allowed failure can be considered part of the repertoire of workplace-based assessment in health professions education. I illustrate how this educational approach can have ramifications for the scholarly conversation about both topics: on how clinical supervisors make decisions during supervision on the one hand and enhance the knowledge of both clinical supervision and entrustment in practice on the other hand.

Much has been written about entrustment in clinical supervision. Influential papers like Ten Cate and Scheele introduced the concept of entrustable professional activities (EPAs) to assess trainees' competence.[2] Hauer et al. explored factors influencing entrustment decisions, including trainees' clinical knowledge, skills, professionalism, and supervision level.[3,4] Ten Cate and Chen explored the dynamic nature of entrustment in competency-based medical education, emphasizing the importance of structured assessment tools and deliberate practice.[5] The authors conducted a thematic analysis of key qualitative studies that analyzed trainee traits clinical supervisors find important when making entrustment decisions in order to synthesize the various aspects documented in the literature.[5] The 13 publications yielded five themes that clinical supervisors include in their entrustment decisions: "Capability (specific knowledge, skills, experience, situational awareness), Integrity (truthful, benevolent, patient-centered), Reliability (conscientious, predictable, accountable, responsible), Humility (recognizes limits, asks for help, receptive to feedback), and Agency (proactive toward work, team, safety, personal development)".[5] Ten Cate et al. synthesized existing literature on entrustment decision-making in medical education, identifying common themes such as trainee autonomy, clinical competence, professionalism, and the impact of assessment and feedback on entrustment decisions.[6] As entrustment decisions might have direct consequences for patients, supervisors rely on a broad range of factors to decide if a trainee can be entrusted with specific clinical tasks.

Allowing failure as a supervisory decision shares features with supervisory entrustment processes. Both supervisory decisions to entrust trainees with a professional activity without supervision and to allow them to fail under supervision deserve careful supervisory analysis of different factors and their interplay. A clinical supervisor may allow trainee failure during a clinical performance while weighing the actual patient safety threat and future patient care with a unique educational opportunity for a trainee. Thereby, different

factors and intuition in this specific clinical situation support the decision to allow failure. During exploring this phenomenon, four main factors influence the supervisor's decision to allow failure: the patient, trainee, supervisor, and environmental circumstances. In this context, exploring the role of supervisors in allowing trainees to fail productively is a critical area for research. By understanding the factors that contribute to trust and entrustment decisions and how supervisors can balance the need for patient safety with the need for productive failure, we can create a culture of learning that supports trainees' development towards autonomy.

However, while careful supervisory analysis of their decisions to allow failure is warranted, it may be difficult to achieve in practice. Whether and to what degree it is possible to make these decisions more analytical in the moment is an open question. Nonetheless, the necessity of careful supervisory inspection is still indisputable; putting this ideal into practice in the real world can be extremely difficult. My in-depth research and comprehensive inquiry into the complex area of allowing failure has shed light on an important aspect: the complexity of such choices. Entrustment decisions are frequently defined by their intuitive and fluid aspects. These decisions frequently develop spontaneously and are influenced by the changing conditions of the moment.[6] The issue that arises is whether it is possible to provide these instinctual decisions with more analytical context in advance. This question, which lingers at the crossroads of theory and practice, emphasizes the difficulty involved in trying to improve decision-making within the contexts of supervision and entrustment. It's crucial to understand that these intuitive and tacit processes, which underlie a lot of entrustment decisions, frequently resist straightforward articulation. In the heat of the moment, trying to make these subtle cognitive functions explicit adds another level of complication to an already challenging endeavor.

Interestingly, however, the existing literature on entrustment avoids the issue of allowed failure. Failure appears only indirectly, implied in discussions of trainee trustworthiness (do trainees acknowledge their limits?) and cast as a risk to be avoided by appropriate supervision and entrustment. I would argue, however, that the pedagogy of allowed failure is compatible with entrustment thinking, with a few key differences. Both decisions center around a central question. Entrustment requires the supervisor to ask, "Can I entrust this trainee with this activity?", while allowed failure decisions centers on the question, "Am I confident that the learning outweighs the risk in this activity?" Both questions are about risk assessment, but the assessment is subtly and critically different.

Like entrustment, allowed failure requires the supervisor to accept risks to patient care when trusting a trainee to act while not fully under the control of the supervisor but also maintaining an optimal balance between trainee learning and patient safety.[7,8] But in an allowed failure, the lack of control in question is not a hypothetical future event but an immediate event that the supervisor sees coming. In my studies, supervisors tended to view themselves as largely in control, referring to themselves as a "safety net" when they allowed failure, but some also recognized that this might not be the case.[9]

Like entrustment decisions, allowing failure in the clinical setting also involves a nonlinear interaction of factors.[10] The extent to which failure is allowed and the specific learning outcomes depend on various factors, including the severity of the failure, the trainee's readiness for independent practice, and the level of support and guidance provided by supervisors. Those nonlinear intersections of factors in both entrustment decisions and allowed failure illustrate the need for a comprehensive and context-specific approach. It requires supervisors and educators to consider multiple factors simultaneously, weigh their interactions, and make nuanced judgments that balance patient safety, trainee growth, and the overall educational goals. This nonlinear relationship acknowledges that the effects of each factor are not constant or linear but rather depend on the dynamic interaction of numerous variables in the clinical training environment.

Finally, entrustment and allowed failure may share the tradition of being 'unspoken' in many clinical situations. Our data show convincingly that supervisors only rarely make explicit their decision to allow failure; similarly, trainees may be allowed to perform EPAs unsupervised without being told explicitly that this was an entrustment decision (as compared to, say, an unexpected and unsupervised opportunity).

8.3.1.1 Balancing act of Nurturing Learning through Allowed Failure for Patient Safety and Trainee Development

The proposed benefit of allowing failure is that it might be safer for the patient and more educational for the trainee to experience failure under close supervision, where more serious consequences can be quickly identified and avoided or remedied.[9] However, some supervisors, such as the two discrepant cases in the pediatric hospitalists study may be reluctant to allow any amount of actual or potential harm to come to their patients for the sake of learning.[11] The issue with this second ideology is its long-term consequences. Error is inevitable and navigating it for the first time as a junior consultant or fully trained practitioner may present undue risk to patients.[12] If physicians are to 'first do no

harm', it may seem like sheltering patients and trainees from error and harm now represents the right course of action.[13] Yet, this course, which requires trainees to learn to correct errors and address them later without backup, may engender inadvertent harms of its own—possibly greater ones.

While patient safety is a crucial consideration that may distinguish entrustment from allowed failure, it is essential to recognize that allowed failure is, in fact, a patient safety-centered pedagogy. At first glance, the concept of allowing failure may appear contrary to patient safety principles, as it involves accepting the risk of potential adverse outcomes. However, the underlying rationale behind allowing failure is to foster a safer healthcare environment by enabling trainees to learn from their mistakes and develop essential skills to prevent future errors. By providing a controlled space for trainees to encounter failure while they have access to guidance and support, allowing failure aims to enhance clinical judgment, critical thinking, and decision-making abilities, ultimately benefiting future patients. While entrustment focuses on individual patients, allowed failure has the potential to improve overall patient care by nurturing a culture of learning, continuous improvement, and error prevention.[11] By acknowledging and addressing the inherent risks of failure in a supervised and supportive environment, allowing failure contributes to patient safety by ensuring that future healthcare professionals are equipped with the necessary skills and knowledge to provide high-quality and safe care.

Clinical supervisors are responsible for overseeing and guiding residents in the clinical setting.[14,15] When failure occurs and supervisors allow it to happen, supervisors may face challenges, especially in managing and supporting trainees through these difficult situations. They must strike a balance between holding residents accountable for their mistakes and providing them with a nurturing learning environment.[7] Supervisors themselves may experience additional stress and pressure when failures lead to consequences under their supervision. It becomes their responsibility to ensure that residents learn from their failures and develop the necessary skills of failure management, as the data revealed in studies 2–5.

8.3.2 Implications for trainee learning, and well-being

In this section, I delve into the pedagogy of allowed failure and its implications for trainee learning and well-being in the clinical setting. A balanced approach to allowing failure while prioritizing patient safety can be valuable for trainee growth, if the prevention of potential negative impacts on their wellbeing is considered.

8.3.2.1 Trainee Learning:

The clinical setting is a dynamic learning environment, where trainees apply their theoretical knowledge to real-life patient care scenarios. There, residents actively engage in direct patient care, where they gain practical skills, clinical judgment, and decision-making abilities by participating in tasks such as history-taking, physical examinations, diagnosing illnesses, treatment planning, and performing procedures under the supervision of attending physicians.[16,17] In this context, residents learn through a combination of various learning approaches that collectively contribute to their development as competent healthcare professionals. According to the developed definition of allowing failure, supervisors may allow failure in different clinical performances: trainees' clinical performance like taking the baby out of the womb during a C-section or other technical procedures and operations, medication, communication, diagnostics and patient management and organization.[7] In this regard, for me, this strategy presents a part of experiential learning in the clinical environment, where different approaches may support learning.[18] Through experiential learning, residents have the opportunity to apply their theoretical knowledge in clinical scenarios with patients, gaining practical skills, clinical judgment, and decision-making abilities.[19] They learn by actively engaging with patients, collaborating with healthcare teams, and navigating the complexities of patient care.[20,21] This approach allows trainees to develop a deeper understanding of the challenges, uncertainties, and complexities involved in clinical practice.

Translating this knowledge into the educational strategy of allowing failure in clinical training, the studies' results show educational benefits for several reasons: Firstly, it provides trainees with the opportunity to learn through firsthand experience, gaining insights into the complexities of clinical practice. By encountering failure, trainees develop critical thinking and problem-solving skills, reflected by supervisors as "error management strategies" (P9) which is vital for the development of a physician.[9] Secondly, allowing failure helps build resilience and adaptability in trainees.[22,23] It teaches them to bounce back from setbacks and adapt their approach to future challenges.[24] Thirdly, failure can highlight knowledge gaps, enabling trainees to identify areas for improvement

and seek further education or mentorship.[25–28] Fourthly, allowing failure promotes the development of clinical judgment by requiring trainees to make informed decisions arising from failure experiences. It helps them weigh risks and benefits, enhancing their decision-making abilities and clinical reasoning.[29,30] Additionally, failure encourages self-reflection and growth as trainees analyze their actions, strengths, and weaknesses, considering the emotional component, which comes with failure.[31] It may foster personal and professional development. Moreover, allowing failure emphasizes the importance of patient safety, instilling a sense of responsibility in trainees, while they become more conscious of the consequences of their actions.

In our study, trainees believed that allowed failure could have a positive learning effect, depending on how they understood the event.[25] Some allowed failures were considered appropriate and necessary for learning, while others were seen as inappropriate or ethical problematic. The perspective of supervisors shed a similar light on learning from allowed failure, while most supervisors allowed trainees to fail for educational purposes.[7,9,11] They intended to educate them on management error strategies to extend their professional growth.[9]

Learning, however, was also influenced by supervisory intention, as trainees believed that learning depended on the supervisor's constructive behavior to learn from the allowed failure.[25] Patient safety was also considered when considering the potential to learn from allowed failures. However, the shared value of protecting against patient impact was in tension with the recognition that failures are memorable learning events because they touch patients. Learning was a possible but not certain outcome of allowed failure, shaped by multiple factors.

8.3.2.2 Trainee well-being:

As medical training involves a steep learning curve in most performances in order to develop to an independent physician, trainees rely on a supportive and constructive environment to develop their skills. In this regard, we know that trainees face unique challenges when failure is present in the clinical setting, while they often work at the edge of their competence. One important finding was the emotional impact of failure as part of the potential educational power of failed situations. Failure in the clinical setting is an inherently stress-provoking experience for both the educator and the learner, and there is no single mental, emotional, or intellectual way that clinicians respond to failure. Given that concerns about trainee wellness are growing and burnout and attrition of trainees are booming[32–34] and now triggered by the COVID-19 pandemic around the globe,[35–37] how does allowed failure fit into this conversation?

Allowing failure without proper guidance and support can have detrimental effects on residents. It can lead to diminished confidence, increased stress, and even burnout. Regarding their sense-making of an allowed failure, their reflection of the event is not transparent: it is subjective at all stages of the process, from recognition to interpretation, to perceived learning.[25] Even if the attribution of destructive behavior of supervisors in using allowed failure is inaccurate, the negative impact on the learning environment is no less real for the trainee perceiving this mistreatment. If allowed failure is experienced as mistreatment, it becomes demoralizing. As Bynum, a medical education shame researcher, has highlighted, failures in patient care can be a trigger for an emotional sentinel event and produce shame in the learner.[38,39] And, as my experience submitting a grant with the 'allowing failure' language suggested, medical educators are sensitive to the danger of provoking shame through allowed failure. In this light, a grant reviewer's stance that we needed a more positive training language and culture (one that doesn't sanction failure as a weapon used by teachers to shame students) makes sense, because of the potential negative impact on the current epidemic of trainee burnout and attrition.[40]

Admitting vulnerability may support the acknowledgement and ultimately lead to an environment of psychological safety.[41–43] However, acknowledging vulnerability in the medical culture has historically been challenging, but there is a growing awareness of the importance of recognizing and addressing this aspect.[44–46] In recent years, there has been an increasing understanding that vulnerability is not a sign of weakness but rather a fundamental part of being human and a necessary aspect of providing compassionate and effective care.[38,47] By acknowledging vulnerability, healthcare professionals can create a more empathetic and supportive environment that promotes overall wellbeing and fosters a culture of learning and growth.[45,48]

As trainee participants shared their interpretations of experiences of allowed failure, they also emphasized supervisory intention. Due to the lack of explicit discussion with supervisors, trainees were left alone and tried to make sense of their failed events. When they judge that they have been allowed to fail, their interpretation of the event is colored by their attribution of supervisor intent, which raises the question of whether perceived intent might impact the educational benefit of the experience or harm trainees. Also, the narrow, technical nature of supervisory conversations about allowed failure leaves trainees alone in their sense-making about issues such as why a failure was allowed and whether it was an appropriate balance of patient risk and trainee benefit.

How can we then ensure that we do not mistreat our trainees while still harvesting the educational benefits of failure? Because harnessing the potential

educational benefits of a teaching strategy such allowing failure while preventing mistreatment of trainees is crucial. One solution might be to engage in explicit and holistic discussions surrounding these experiences – in the direct conversation of trainees and supervisors and in the scholarly conversation in the medical education community.[49,50]

The lack of explicit acknowledgment of allowed failures in clinical settings poses challenges to experiential learning. Trust is crucial in the supervisor-resident relationship,[3,4,51] as it influences trainees' perceptions of patient care obligations, learning opportunities, and overall growth as physicians. Trust allows residents to express concerns, seek clarification, and share experiences without fear of judgment or reprisal, fostering psychological safety. Residents needs to trust that supervisors prioritize their best interests and are committed to their professional growth. Trust also leads to enhanced skill development and knowledge acquisition, and directly impacts patient safety.[52,53] Another idea to harness the educational benefits of allowing failure while preventing mistreatment of trainees, is to enhance the learning conversations happening during and after the incidents. Currently, the learning conversations in our studies tend to focus narrowly on technical aspects, emphasizing solutions and prevention of failure – often without acknowledging the failure itself or even use failure as a term or a synonym for it. However, our findings suggest that debriefing should also encompass the emotional dimension of experienced failure, as it appears to be a critical component of perceived learning. Constructive learning conversations are challenging to achieve, particularly when discussing actual errors.[54,55] Therefore, we propose that supervisors explicitly acknowledge when they have allowed a trainee to fail, provide an explanation for employing this supervisory strategy, conduct debriefings that explore the impact of failure on learning, emotions, and the supervisory relationship.[56–59] Additionally, supervisors should make their risk/benefit analysis visible to address trainees' concerns about patient safety during discussions of clinical situations. The effectiveness of this supervisory approach depends on the presence, quality, and precision of these explicit and constructive learning conversations. Moreover, failure without appropriate learning conversations may even hinder trainees' professional growth and impede the development of crucial clinical competencies.[60,61]

As reflective individuals, trainees were able to learn from the mistakes, but the impact of the failure on the trainee's learning was not certain, especially if emotions were triggered through such failures.[39] Consequently, supervisors must be deliberate about whether allowed failure may lead to learning and potential emotional consequences, what may support or hinder learning. Recognizing and responding to these factors can optimize the effectiveness of supervisory educational strategies and contribute to the professional growth and development of residents.

8.3.3 Implications for patient care and safety

In this section, I explore the implications of allowed failure for patient care and safety in the clinical setting. I examine how a balanced approach of allowed failure, which considers both trainee growth and the priority of patient safety, can be valuable while mitigating any potential negative impacts on patients. By illustrating the delicate balance between allowing failure as a learning opportunity and maintaining the highest standards of patient care, I shed light on the implications of this pedagogical approach for ensuring optimal patient outcomes and safety while discussing ethical considerations.

My empirical work on allowed failure showed that patient safety is the primary concern for both supervisors and trainees.[9,11,25] At first glance, this might be seen as a paradox, as patients' safety might be potentially threatened by this pedagogy. Supervisors, however, recognized that while the pursuit of learning and professional growth is essential, it must always be conducted within the framework of safeguarding patient well-being. This sophisticated approach understands that healthcare professionals must balance the need for trainees to experience and learn from failure with the overarching responsibility to ensure optimal patient care and safety. Integrating this awareness into educational practices, those who allowed failure to happen should strive to create a supportive learning environment that upholds the highest standards of patient safety and cultivates the skills and resilience necessary for trainees to navigate the complexities of healthcare effectively.

In general, in the field of medical education, there is an underlying acknowledgment that training healthcare professionals requires a delicate balance between optimal patient care and opportunities for learning.[14,62,63,2] This tacit agreement implicitly accepts that, at times, less-than-optimal care may be provided to patients in order to facilitate the training of future healthcare providers. This ethical dilemma has been a subject of discussion in my papers and talks, eliciting diverse responses from different audiences.[7,9] While some individuals recognize the inherent nature of clinical training with its associated compromises, others express deep concern about the ethical implications of allowing failure. It is crucial to delve into this central issue that often remains unspoken. By exploring this tension between patient safety and the educational needs of medical trainees, the research on allowing failure can further shed light on the complexity of medical education and the potential impact on healthcare outcomes in order to provide a foundation for understanding the ethical considerations and the need for ongoing dialogue and improvement in the field.

The four-principles approach of biomedical ethics, as proposed by Beauchamp and Childress, offers a comprehensive framework for examining ethical issues in healthcare, entailing consideration of respect for autonomy, nonmaleficence, beneficence, and justice.[64] This framework promotes a balanced approach that prioritizes patient safety, resident education, and fairness in the provision of training experiences.[65,66] When considering the concept of allowing residents to fail in clinical training, it is important to analyze the ethical implications through each principle of the framework. Respect for autonomy is a key principle that highlights the significance of honoring individuals' autonomy and their right to make informed decisions about their healthcare.[67,68] In the context of allowing residents to fail, patients would have to be fully informed about the potential for failures and the educational purpose behind them. Patients' autonomy should be respected, and they should have the opportunity to provide consent for participating in training scenarios that might involve allowed failures. However, spelling it out for patients using explicit language and explaining that trainees will be involved in patient care and may be allowed to make mistakes in their learning seems unrealistic. The explicit acknowledgment of trainee involvement and the potential for failure in their learning process might shatter patients' trust right from the start and might introduce additional anxiety, confusion, or loss of confidence in the healthcare system or individual healthcare providers. Here, it is essential to strike a delicate balance between providing accurate information and avoiding undue alarm or disruption to the patient's well-being.[69] One may imagine an implicit understanding of ethics if supervisors mention that trainees will be involved that such failure in general and allowed failure situations might happen, as one trainee suggested in the study:

> If you have a big conversation with them and you're both agreed on the direction of travel, whether that's an operation or a clinic appointment or whatever, and on your consent form you say these are the risks, then I think certainly there's a certain amount of, they know what they're getting themselves into. And, if that's okay with them, then that's okay with them. Then, if you make a mistake, if you fail, then you've been explicit with them. …. I think having a duty of candour, shared decision-making, and a robust consenting process. Plus, being explicit to patients, it's like, you're in a teaching hospital. I think it's okay. Realistically, I think we need to maybe do a thing with patients, that they need to understand that doctors are fallible. Like, they hold us to a perfect standard as well and I think sometimes patients need to be reminded that we make mistakes. Not just residents, either. It's a thing, we make mistakes. We will do our best not to, but it happens. It's not that there's nothing we can do about it, but it is what it is. (P13)[25]

Considering the potential consequences of allowing failure, nonmaleficence, the principle of "do no harm," emphasizes the importance of preventing harm to patients. While allowing residents to fail may involve inherent risks, it is crucial to implement appropriate measures to mitigate harm.[70] This includes ensuring adequate supervision to mitigate unnecessary harm to patients, as described in our supervisory study.[9] Supervisors described a range of potential consequences for patients, resulting in potential harm: pain, bleeding or hematoma because of procedures; possible suboptimal wound healing or skin incisions; multiple, wrong, or painful punctures; excessively deep sedation during anesthesia; delay in patient care in the ambulatory setting or longer waiting time in the emergency room.[9] However, supervisors also tried to decrease the risk of harm as best as they could, emphasizing that the potential consequences of allowed failures should be "really small" (P1) and "not dangerous" (P5).[9] They also described rescue strategies employed to prevent an allowed failure from impacting patients more than anticipated. In this sense, and after a quote from the first participant in our study, I called one paper: "Whatever you cut, I can fix it".[9] Although failure was allowed, supervisors referred to themselves as a safety net that could be invoked to reduce patient harm while harvesting learning for trainees. However, some supervisors spoke as though they could fix anything, which is almost certainly inaccurate and may be a problematic attitude for safe use of the educational strategy of allowing failure.[9,11]

Beneficence, which focuses on promoting the well-being and welfare of patients, must also be considered in the context of allowing residents to fail.[71] While these experiences can offer valuable learning opportunities, the potential risks and harms to patients must be carefully weighed against the educational benefits. The educational value of allowing failures should outweigh any negative impact on patient care, and efforts should be made to maximize positive outcomes for both residents and patients.[7] Justice, the principle of fairness, requires an appropriate distribution of resources and opportunities, so that patients have the right to expect equitable, fair treatment from healthcare providers in order to receive the highest standard of care available.[72] In this regard, allowing residents to fail during patient care may not meet this standard and endanger patients' care and safety. Patients are not passive recipients of care, they can advocate for themselves if they know about such phenomena in clinical training. Some patients may even choose not to receive treatment in hospitals with an educational program. Their engagement, advocacy, and demand for fairness and transparency play a vital role in ensuring that the principle of justice is upheld, ultimately leading to better healthcare outcomes for all.[73,74]

The question of whether patients should be informed when an allowed failure occurs in their medical treatment raises further complex ethical considerations. In general, patients have the right to be informed about their medical care, including any adverse events or failures that may have occurred. While patients cannot provide informed consent for unforeseen failures in advance, there is a debate regarding the disclosure of such incidents after they occur.[75,76] Currently, it should be common practice to disclose failures to patients,[77–80] albeit often without explicitly mentioning that the failure was allowed or anticipated. Disclosing failures to patients is rooted in principles of transparency, honesty, and respect for patient autonomy.[81,82] This enables them to make informed decisions about their future treatment and care options. However, the question of whether to disclose the "allowed" aspect of a failure is more nuanced.

I have to consider also transparency, even if not one of the four ethical principles, as it represents a cornerstone of patient-centered care and trust. Withholding information about allowed failures may raise concerns about honesty and the overall transparency of the healthcare process. Patients have the right to be fully informed about their care, including any anticipated risks or failures, as this allows them to actively participate in decision-making and maintain trust in their healthcare providers.[75] However, reporting allowed failures can also present challenges. In some cases, the complexity of medical procedures and the balance of risks and benefits may make it difficult to fully convey the concept of an allowed failure without causing unnecessary anxiety or confusion. Striking the right balance between providing accurate information and avoiding undue alarm can be a delicate task. On one hand, disclosing that a failure was allowed may provide patients with a clearer understanding of the complexities of medical treatment and the trade-offs involved in certain procedures or interventions. It can foster trust and shared decision-making by involving patients in the process and allowing them to contribute to their own care. On the other hand, disclosing the "allowed" aspect may introduce additional anxiety, confusion, or loss of confidence in the healthcare system or in the individual health care provider. Patients might question why certain failures are allowed and whether they have been exposed to unnecessary risks. Ultimately, the decision to disclose the "allowed" part of a failure should be approached on a case-by-case basis, taking into account the specific circumstances, the patient's preferences, and the professional judgment of the healthcare team. Ethical guidelines and legal requirements vary across jurisdictions, further complicating the issue. Open discussions among healthcare professionals, patients, and ethics committees can help shape policies and practices that strike a balance between transparency, patient-centered care, and the overall well-being of patients.[83]

Balancing the need for transparency with patient well-being requires careful consideration, in the first place by clinical supervisors, who allow failure. It is important to explore ways to enhance patient education and communication to ensure that the concept of allowed failures is appropriately conveyed without compromising trust or causing unnecessary distress. This may involve developing open conversations among healthcare professionals, ethicists, and patient advocacy groups for reporting and discussing allowed failures, contributing to the development of best practices in reporting allowed failures. By fostering a culture of transparency and shared decision-making, healthcare systems can strive to uphold ethical principles while ensuring patient safety and well-being.

Drawing on my first, conscious experience with an allowed failure in the operation theatre in my role as a surgical supervisor, I recall that my trainee and I reported the failure of the liver lesion during the gallbladder resection to the patient, but I didn't confess that I allowed it to happen to not lose his trust in the healthcare system or in us as his individual surgeons. Therefore, I acknowledge that open conversations with patients about this topic is challenging. While the generic principles of patient consent and transparency suggest the disclosure of trainee involvement, including the potential for failure in their learning, the practical implementation remains demanding – even in my imagination as a clinician who conducts research around this topic and suggests open conversation about it. Ethical considerations become more intricate when we move from generic principles to the practical implementation of these principles. It is crucial to recognize that the dynamics of patient consent and the disclosure of allowed failures are highly context-dependent and require careful consideration. Each situation may present unique factors that need to be considered, such as the complexity of the medical procedure, the individual patient's preferences, and the potential impact on the patient's well-being and trust in the healthcare system and the individuals involved.

8.4 Grappling with language

Language has to be considered as a conceptual framing as it is how we describe and communicate ideas, concepts, or real life phenomena in medical education research to our audience.[84,85] It shapes the way we think and interpret the world around us, and we can use words and their meanings to influence the thoughts and actions of others. In this context, language is a powerful tool for both understanding and affecting the world.[86] In addition, it allows us to share

experiences and ideas, debate and discuss, and develop new ways of thinking and acting.[87] The words we use to describe a phenomenon can influence how we perceive it and can also have real-world implications for how we respond to it. Therefore, it is important to be thoughtful and intentional about the words we use to describe those issues. Knowing about those assumptions and the power of language, I considered, as mentioned in the introduction, different terms for this research program.

Terms such as "productive failure" have served as a basis for discussing the phenomenon in elementary school education and also higher learning sciences.[88–90] When I proposed the term "failure" for my research program, I tried to acknowledge and incorporate the lessons failure is teaching us, especially in clinical training, while creating an incredible amount of opportunities to learn, not necessarily expecting an unsuccessful outcome for patients. This term, however, may not transfer readily to the medicine and the medical community, as our relationship with failure is complicated by patient safety concerns.

The study explorations revealed that participants used a striking range of terms: "failure," "error," "mistake," and even "struggle" were often applied synonymously. After encouraging the participants to reflect on the term "allowing failure," which we used in the interview protocol without defining it for the participants, some participants contemplated the reputation of the word failure in healthcare, expressing their discomfort, as well as audiences during or after presentations did. Even as they told stories to illustrate their experiences of this phenomenon, they described "failure" as "a very strong" (P3 of study 2) or "heavy" word (P10),[9] which "is so negative, … it happens all the time" (P17)[9] and mused about its appropriateness. As one of the supervisor participants philosophized:

> I think from my perspective if I see it, then I would call it a failure, maybe the trainee would say I made a mistake. Probably you also could call it a mistake, but if I let it happen, then for me I would call it a failure and not a mistake. I think a mistake is more if I'm also part of it and not recognizing that something is going wrong. (P1)[9]

Others used alternative wordings, including 'to take a natural course' and "creating room for mistakes to happen, or creating enough distance that the resident can learn from their own mistakes rather than allowing failure to happen." (P12); 'another way of doing it (P6, P13)'; 'making own experiences' (P9); and "struggle" (P13, P18).[9] Some participants referred to 'trial and error' instead of "allowing failure" or perceived differences between the two strategies, while one physician defined 'creating room for mistakes' (P12) as a continuum of

(P5, P11, P19) 'trial and error' (P19).[9] However, there was no consistency across the sample regarding a preferred term for the phenomenon; instead, one internist declared allowing failure might be difficult to define in their specialty: 'I think it depends on what we define as mistake. I mean, I work as an internist and there it's not only black and white but often it's grey, and a mistake is not always a mistake, it's maybe also just another way of doing it.' (P6).[9]

When explaining this phenomenon, supervisors and trainee may avoid using the term failure for several reasons. First, the term "failure" has, as mentioned, negative connotations and may be perceived as reflecting poorly on the supervisors who use this strategy or even on the trainees who come to realize that such a phenomenon is happening in clinical medicine. The use of this term may create a negative atmosphere and may hinder open and honest communication between the supervisor and trainee. Second, as described in our trainee study, the use of the term "failure" may foster risk of misunderstanding and -interpretation of this phenomenon, especially by trainees who are less experienced or less confident in their abilities. Trainees may interpret "failure" as an indicator of incompetence or a lack of ability, rather than as an expected part of the learning process. Third, some supervisors and trainees may prefer to use more positive or at least neutral terminology, such as "challenging experiences" or "learning opportunities," to describe situations where trainees struggle or make mistakes. This terminology may be seen as more constructive and may emphasize the value of the learning process rather than the negative aspects of making mistakes. Last, the use of the term "failure" may be influenced by cultural factors. In some cultures, the term "failure" may be seen as a taboo or as reflecting poorly on the individual, and alternative terminology may be preferred to avoid negative connotations. On the one hand, I have to acknowledge that supervisors and trainees may prefer to use alternative terminology to describe situations where trainees struggle or make mistakes to avoid negative connotations, misunderstandings, or cultural differences. This terminology may emphasize the value of the learning process and promote a constructive and supportive learning environment. On the other hand, those terms have different definitions and can lead to confusion when used interchangeably. Additionally, there are both obvious and hidden agendas associated with these terms, which can create resistance among clinicians and researchers when deciding which term to use.

And, as I discovered in the international study of clinical supervisors' perceptions of allowing trainee failure for learning, the definitional challenge intensifies when translation is necessary (Chapter 3-5). Being a German native speaker,

to translate from English to German, for instance, I ended up with more than ten results for "error" and at least the same amount for "failure", heightening the potential for misunderstanding of sociolinguistic nuances.

The challenge is even more profound when you explore failure in an international medical education context.[91] Working in an international research team that interviewed faculty in Switzerland and Canada regarding the role of failure in clinical learning, I had the interesting experience of trying to translate these terms to my native language German. Like other scholars translating their research results, I encountered translation challenges.[92] For instance, we may translate these failure synonyms, and you'll end up with around ten results for error and at least the same amount for failure. And their meanings are not the same. For example, error, like failure, led to the overarching translation of "Fehler," but also resulted in "*Irrt*um" and "*Irr*ung" with the same word stem err-which traced me back to the Latin routs. "*Err*are human est" - to *err* is human. If you take a closer look here, suggested synonyms of "*to err*" are to wander, to roam, to ramble.[93] On the other hand, failure is seen as the counterpart of success, an attempt to succeed, without the aspect of misapprehension. Because language embodies attitudes, the researcher and also the audience have emotional reactions to these terms. They invoke reactions, especially terms which have 'bad connotation' or even 'harmful reputations' as failure. This mindset, wherein we embrace and maximize the value of failure for clinical learning, will only be possible when we come to terms with the word itself.

Therefore, I also have to admit after using "failure" in this line of work, I am still not confident about this term. Medical educators need a shared vocabulary if we are going to have difficult conversations about the role of failure in learning. Language matters: we cannot unpack this complex phenomena without shared and precise language. Being fixated on the language, however, may also be a way to avoid confronting the underlying tensions or complexities of the explored phenomenon. Finding the "right" word can sometimes feel like a way to simplify or resolve complex issues, when in reality, the root causes of those issues may be more difficult to address. Overall, I suggest with the knowledge from other fields and this research, if we use failure in medical education, we should mean explicitly to include the learner's development in our meaning to distinguish from medical error, the central term in the patients' safety literature. However, even an accumulation of research insights may not rid the concept of its negative connotations in our field. We have yet to achieve a mindset wherein failure (and similar terms) is routinely embraced as part of learning, rather than hidden as a source of shame. It may therefore be worthwhile to explore the phenomenon

further in various clinical contexts, specialties, and in different cultural contexts in order to distinguish different conceptualizations of it. My aim would be to gradually overcome the bad reputation of failure in the context of medicine and medical education, but this will require reflecting further profoundly on failure and discussing the available terms and, possibly, creating new ones that capture the nuances of the phenomenon in the clinical learning setting, including the personal and professional consequences for patients, trainees and supervisors. Such scholarship will need to be careful and explicit so that, as we decide what terms to use, we take into account both their denotations and their connotations.

8.5 Grappling with a taboo topic

The potential sensitivity surrounding failure in healthcare is a crucial consideration that significantly impacted the thesis. Additionally, given the primacy of patient safety as an untouchable value in medicine and that trainees' wellbeing might be at risk when clinical supervisors use a strategy such as allowing failure, one could even say the phenomenon is taboo. Reflecting what a "taboo" is makes some reactions to my research more understandable. The Polynesian word "taboo" is a subject, a word, or an action, that has to be avoided for social, religious or moral reasons. It entails something uncanny, dangerous, or forbidden.[94] Originally, a taboo was the objectified fear of the demonic power, which demands the placation of the demon whenever the taboo has been violated.[95] After violating a taboo, knowingly or unknowingly an automatic punishment was expected from the power of the godhead.[95] Translated in our time, we might call it a betrayal of our "tribe", which is in my case on the one hand the surgical and on the other hand the medical education community. If you violate theses days a taboo, our society might punish the offender and in the worst case makes the offenders themselves a taboo. Working on this phenomenon of a sensitive nature, I realized early on that my research made me feel like an offender.

The presentation about this taboo triggered sensitive responses for grant submissions, sensitive responses in presenting this topic in front of an audience and doubtful colleagues and chiefs, who mostly gave me a sense of punishment for researching this topic in both communities: at the medical education conference of the *Association of Medical Education in Europe (AMEE)* 2019, I experienced a frustrated and "allowing failure" disapproving audience in the form of gestures, facial expressions, and agitated whispering during the presentation of the first data.[9] One of the audience participants apologized for

his behavior after the same presentation. In the surgical community, during the application process for the Ph.D., I was called in the office of one of my chiefs to explain why I was interested in this topic, while he recommended to choose another research area. My future chief mistrusted this research in a similar manner, saying that I was allowed to pursue this program further under two conditions: one, I was not allowed to use this strategy as an educational one in the hospital, and second, I was not allowed to involve patients as part of a planned exploration of this topic. He went even a step further in stating: "Don't bring me the press into this house with this research". Consequently, I had to work around and change my research program until he retired at the end of last year. As another prime example, one reviewer of a grant submission, wrote and I quote: "I do *not* recommend that X (the organization) should fund research into failure. … "I think it would be possible to construct research into failure, but I strongly suspect that doing so would also construct the phenomenon of failure, whether or not it is a valid concept. ... To even contemplate constructing failure as part of an educational relationship is turning the medical education clock back 50 years. Moreover, the epidemic of burnout and loss of trainees mandates a more positive training language." Those instances revealed different causes of why we don't talk about this phenomenon yet. One, as mentioned, the language issue as failure triggers bad connotations. Second, allowing failure in healthcare can be problematic on different levels for all individuals involved.

I am convinced that we should talk about it, even if I have experienced uncomfortable incidents by doing so. The silence around allowing failure is problematic because we know that learning is strengthened when explicit conversations happen between supervisors and trainees.

Finally, explicit conversations would help us in clinical training and practice, which I actually discovered during one of my own surgeries, where I resected the right part of the large bowel on an elderly patient. Another, more experienced colleague joined and assisted me. In one situation, I clamped fat tissue to resect the bowel, but I put too much tissue in the clamp. So, after I cut it, it started to bleed and I said: "Damn, I thought it could be too much tissue in that clamp. And my colleague confirmed: Yeah, I know. And I asked: why didn't you say something? And he replied: Well, this way you learned it better and it won't happen another time. I had an *"Aha moment"* and said: You know that you allowed me to fail and that is what my research is all about. This situation prompted a fruitful discussion about that and similar situations on the table, but *only* because I recognized what happened and made it explicit. Otherwise, it might have been lost. Therefore, supervisors, peers and colleagues should

communicate more openly with one another when it comes to such situations in order to realize the intended educational benefit of the experience. Whether or not allowed failure achieves its potential educational benefit in our field may depend on the quality of these conversations. My message is that we have to acknowledge that failure is inevitable and also a powerful teacher. Allowing failure to happen in clinical training can be seen as problematic but also has its potential for learning and growth.

8.6 Merits and Limitations

Insider research provides valuable insights into the lives and experiences of specific communities, researchers need to be aware of the potential limitations associated with this approach.[96] However, one of the main disadvantages of insider research is the potential to misunderstand or misinterpret perceptions as I have to admit my personal beliefs about the explored phenomenon, my attitudes, and experiences that could have influenced the conducted exploration, its findings and, in the end, the participants. My assumptions about allowing failure could have played a role, especially in the interview studies with clinical supervisors. In this regard, because I was a peer myself, participants might not have to tell details explicitly because they assumed that I "got it" or because I "got it" they did not always provide explicit material in the transcript cause we both just understood each other without really explaining things, while an outsider would have asked more explicit.

Regarding the interview study with trainees, one could remark on ethical concerns that I interviewed residents who worked below me in the hospital hierarchy, even if no one experienced damage to their career. However, building a rapport with trainee participants gave them the confidence to share their thoughts and feelings without fear of judgement.[97,98] On contrary, with some of my own reflections from my residency[99] or even non-verbal confirmations with a simple nodding during the interviews,[100] I tried to foster an environment of mutual trust and respect. Also, in the same study, I experienced difficulty maintaining appropriate distance from the participants as they reported their heavy emotions regarding the failed clinical situations with potential impacts on patients, which may have affected my ability to observe and analyze the situation or later on the data analysis.[25] While conducting an interview with a participant who was describing a traumatic event like the pediatric surgery resident, who had injured the urethra of a baby, I was able to observe and analyze the situation more deeply because of the heavy emotion that I felt from the

participant. I was able to approach the interview with a more sympathetic attitude, which enabled me to notice more subtly expressed cues and details that I might have otherwise missed. I also felt more emotionally connected to the participant and their story, which helped me comprehend the situation and what the participant was going through.

Another limitation of our research context is that it exclusively focused on Western cultures. This means that the research and findings may not apply or represent the perspectives and behaviors of individuals from non-Western cultures, while research in other cultures is important going forward.[101]

8.7 Impact Paragraph

This brief section serves as a reflection on how the research presented in this thesis has impacted both society and science.

While the medical education literature was silent on the idea of allowing failure in clinical training at the outset of this work, publications from other domains acknowledged the educational power of this strategy and its complexity. Situations when I began this work, publications from other domains acknowledged the educational power of this strategy and its complexity. This literature already implied that the educational strategy of allowing failure is a complex phenomenon: there is a recognition that making mistakes helps the learner to attain progressive independence,[102–105] but it is critically important to understand what a learner already knows and to have an optimal supervisory relationship.[14] We seek to develop a deeper understanding of the nature and extent of this practice by exploring the educational strategy of allowing failure in clinical training and understanding the various factors that influence clinical supervisors' judgment of when failure suffices to promote trainee learning but is not so great that patient outcome will be affected. This judgment of the clinical and educational situation and the balance between patient safety and trainee learning is based on individual supervisors' feelings and experience. As I leveraged the insights of areas such as pedagogy, higher education, psychology, and business administration, I was able to construct research of allowing failure in the clinical context. The description of the theoretical model and the complexity of allowing failure in healthcare could support discussion and debate not only in the medical education community but also in other domains such as higher education. In collaboration with Naomi Steenhof, who investigates the critical role of failure in learning and understanding how conceptual knowledge development

supports novice health professional students in clinical problem-solving, I previously presented this topic at the University of Toronto's Best Practice in Education Rounds (BPER) on "Failure in Training – powerful and productive or demoralizing and counterproductive?"[106]

This work offers a conceptual framework that clarifies the underlying principles and components of allowing failure in medical education, which can be applied to understand similar educational phenomena or transferred to design effective research to explore those. An understanding of the complexity of such social phenomena as allowing failure in medicine could help researchers in other domains to explore various issues that emerge from the debate around educational strategies. I had the opportunity, honour, and pleasure to speak to various audiences about the phenomenon of allowing failure at research meetings at CERI, London, Ontario, or the Medical Education Institute of McGill University, Montreal, or scientific conferences such as AMEE 2018 (Poster presentation), 2019, 2022 (both research paper presentations and one point of view), and 2023 (accepted short communication). In this regard, I discovered how passionate a researcher and an audience can be about a topic, in both a positive and a challenging manner. I learned that I don't particularly appreciate talking about unspoken issues to provoke or because it makes them not taboo anymore, sometimes having the feeling provoking the audience and possibly having to endure negative responses to my raising of a taboo topic. However, keynote lectures, such as the RIME keynote in Nashville in 2022, the nursing jubilee symposium at the University of Basel in 2023, or the IML/MME grand round in Berne, were fantastic opportunities to communicate my research findings on the one hand, and on the other hand were difficult experiences of navigating numerous questions and comments and having to think even more deeply about my research and its uptake in the world. Tackling this research program was a blessing and, from my perspective, a necessary effort, but it was not always easy handling audiences' and readers' reactions to this sensitive topic. When done well, I think my talks could be a force for good, helping us confront important and often uncomfortable truths, shapes opinions, and changes behavior.

This research may also contribute to non-clinical literatures (such as those in higher educational which already discuss productive failure) as well as it offers the first insights into this educational phenomenon in a clinical workplace learning environment. This contribution may foster interdisciplinary collaboration while stimulating cross-pollination of ideas and promoting the exploration of common challenges and the development of innovative ideas in other fields,

such as education, organizational management, or leadership development. In this regard, I suggest further ethical and social considerations surrounding allowing failure while finding a careful balance between innovation and risk mitigation in areas such as professional integrity and responsibility, or decision-making.

Based on my research program experiences, I developed and implemented workshops on "How physicians deal with failure" for medical students at the University of Basel, and I learned from the participants that they had already witnessed significant error situations that resulted in negative results.[107] They are frequently surprised because they believe that clinical supervision shields them from failure and its potential consequences. So far, medical students have been provided with a safe atmosphere in the context of clinical courses and internships. Failure is an emotionally taxing event that frequently clashes with ideals of being a physician with a "perfect white coat". (Manuscript in prep.) As a result, I address how physicians deal with failure early on in order to convey my notion that demonstrating sensitivity to failure is a strength. At the very least, it promotes the creation of a psychologically secure environment in which students and residents feel really supported by sharing personal failure stories in order to encourage their learning and growth. I believe that trainees should seek honest dialogues with supervisors while keeping transparency; they will not be disappointed. This work contributed to the scholarly debate around failure by receiving the Patil Innovation Award at AMEE 2022 and being published as an innovation report in Academic Medicine.

8.8 Future research directions

By considering the implications, the societal and scientific relevance my thesis serves as a catalyst for further research and innovation. It can stimulate discussions and encourage researchers to explore new avenues and build upon the work presented.

With the outlined studies, I generated insight about allowing failure in the clinical field and presented the perspectives of clinical supervisors and residents, by developing a theoretical model of this phenomenon that describes this practice and support discussion of it in the medical education community. Patients are the third aspect of this complex triangle in clinical training. Therefore, I am intrigued to explore in another constructivist grounded theory study how patients understand educational strategies for trainees in the health

care environment and in particular their perceptions of the strategy of allowing failure in clinical training. I anticipate that such knowledge about patient perceptions of this issue is a necessary piece of the puzzle to support supervisors in their individual decision-making about when, why and how allowing failure in supervisory situations may be allowed. Patient perceptions might also guide program directors and policymakers in developing and implementing policies that are relevant and transferable for such supervisory situations. Additionally, incorporating patient perspectives can enrich these conversations. Encouraging patients to share their experiences and actively participate in discussions about allowed failures can provide valuable insights and contribute to a more patient-centered approach to care. Patients can offer unique perspectives on the ethical implications, their expectations regarding disclosure, and how the healthcare system can better engage them in these conversations.

Another research approach might help to understand allowing failure in depth and the distinction between allowing failure and other strategies such as allowing struggle. Failure and struggle in clinical training are integral parts of the learning process and occur when trainees are confronted with new tasks, skills, or responsibilities. Both represent the inherent complexity of clinical practice and the gradual acquisition of expertise. Failure involves a deviation from the expected level of performance, resulting in potential shortcomings or consequences. Struggle seems to represent the usual challenges and difficulties inherent in the learning process, where trainees may experience setbacks or encounter obstacles but ultimately continue to progress and improve.[108] While failure and struggle may share similar ideas and challenges, the distinction remained unclear in the data.

Through observation and field interviews of trainee-supervisory dyads in the operation room, I aim to explore the phenomenon of failure and struggle in the operation room as a learning opportunity and its influences on the resident and the resident-supervisor-relationship. With my expertise as a surgeon, I will be able to see potential failures emerging while observing a surgical teaching situation. The field observation will be supported by post-interventional interviews to get further insights from participants and an even deeper understanding of the perceptions of supervisors and trainees.[109]

Another idea of approaching a completely different angle of analysis is to provide a textual analysis of documents that set out the medical legal aspects of this issue in postgraduate training contexts. Exploring the purposes and objectives of records puts them into perspective and helps to determine whether other sources of data need to be sought.

Conclusion

Clinical supervisors allow trainees to fail in different clinical settings, and this decision-making is influenced by both different factors and their intuition. This research program advances the ways we think about failure and allowed failure as an educational strategy in clinical training situations. This understanding opens the conversation about such complex phenomena in medical training and offers helpful insights for educators when using such strategies.

References

1. Gilchrist T, Hatala R, Gingerich A. A collective case study of supervision and competence judgments on the inpatient internal medicine ward. Perspect Med Educ. Published online January 25, 2021. doi:10.1007/s40037-021-00652-1
2. ten Cate O, Scheele F. Viewpoint: Competency-Based Postgraduate Training: Can We Bridge the Gap between Theory and Clinical Practice?: Academic Medicine. 2007;82(6):542-547. doi:10.1097/ACM.0b013e31805559c7
3. Hauer KE, ten Cate O, Boscardin C, Irby DM, Iobst W, O'Sullivan PS. Understanding trust as an essential element of trainee supervision and learning in the workplace. Adv in Health Sci Educ. Published online July 27, 2013. doi:10.1007/s10459-013-9474-4
4. Hauer KE, Oza SK, Kogan JR, et al. How clinical supervisors develop trust in their trainees: a qualitative study. Med Educ. 2015;49(8):783-795. doi:10.1111/medu.12745
5. ten Cate O, Chen HC. The ingredients of a rich entrustment decision. Medical Teacher. 2020;42(12):1413-1420. doi:10.1080/0142159X.2020.1817348
6. ten Cate O, Hart D, Ankel F, et al. Entrustment Decision Making in Clinical Training: Academic Medicine. 2016;91(2):191-198. doi:10.1097/ACM.0000000000001044
7. Klasen JM, Teunissen PW, Driessen EW, Lingard LA. 'It depends': The complexity of allowing residents to fail from the perspective of clinical supervisors. Medical Teacher. Published online October 11, 2021:1-10. doi:10.1080/0142159X.2021.1984408
8. De Jonge LPJWM, Govaerts MJB, Timmerman AA, Muris JWM, Kramer AWM, Van Der Vleuten CPM. Supervisors' approaches to the early entrustment of clinical tasks: an observational study in general practice. BMJ Open. 2022;12(8):e055471. doi:10.1136/bmjopen-2021-055471
9. Klasen JM, Driessen E, Teunissen PW, Lingard LA. 'Whatever you cut, I can fix it': clinical supervisors' interview accounts of allowing trainee failure while guarding patient safety. BMJ Qual Saf. Published online November 8, 2019:bmjqs-2019-009808. doi:10.1136/bmjqs-2019-009808
10. Klasen JM, Lingard LA. The butterfly effect in clinical supervision. Perspect Med Educ. Published online March 22, 2021:s40037-021-00659-8. doi:10.1007/s40037-021-00659-8
11. Klasen JM, Beck J, Randall CL, Lingard L. Using Trainee Failures to Enhance Learning: A Qualitative Study of Pediatric Hospitalists on Allowing Failure. Academic Pediatrics. 2023;23(2):489-496. doi:10.1016/j.acap.2022.11.010
12. Singh H, Thomas EJ, Petersen LA, Studdert DM. Medical errors involving trainees: a study of closed malpractice claims from 5 insurers. Arch Intern Med. 2007;167(19):2030-2036. doi:10.1001/archinte.167.19.2030
13. Institute of Medicine (US) Committee on Quality of Health Care in America. To Err Is Human: Building a Safer Health System. (Kohn LT, Corrigan JM, Donaldson MS, eds.). National Academies Press (US); 2000. Accessed April 26, 2020. http://www.ncbi.nlm.nih.gov/books/NBK225182/
14. Kilminster S, Cottrell D, Grant J, Jolly B. AMEE Guide No. 27: Effective educational and clinical supervision. Med Teach. 2007;29(1):2-19. doi:10.1080/01421590701210907
15. Kilminster SM, Jolly BC. Effective supervision in clinical practice settings: a literature review. Med Educ. 2000;34(10):827-840.
16. Holmboe ES. Methods for Evaluating the Clinical Competence of Residents in Internal Medicine: A Review. Ann Intern Med. 1998;129(1):42. doi:10.7326/0003-4819-129-1-199807010-00011
17. Cottrell D, Kilminster S, Jolly B, Grant J. What is effective supervision and how does it happen? A critical incident study. Med Educ. 2002;36(11):1042-1049.
18. Yardley S, Teunissen PW, Dornan T. Experiential learning: Transforming theory into practice. Medical Teacher. 2012;34(2):161-164. doi:10.3109/0142159X.2012.643264
19. Yardley S, Teunissen PW, Dornan T. Experiential learning: AMEE Guide No. 63. Medical Teacher. 2012;34(2):e102-e115. doi:10.3109/0142159X.2012.650741
20. Teunissen PW. Experience, trajectories, and reifications: an emerging framework of practice-based learning in healthcare workplaces. Adv in Health Sci Educ. 2015;20(4):843-856. doi:10.1007/s10459-014-9556-y

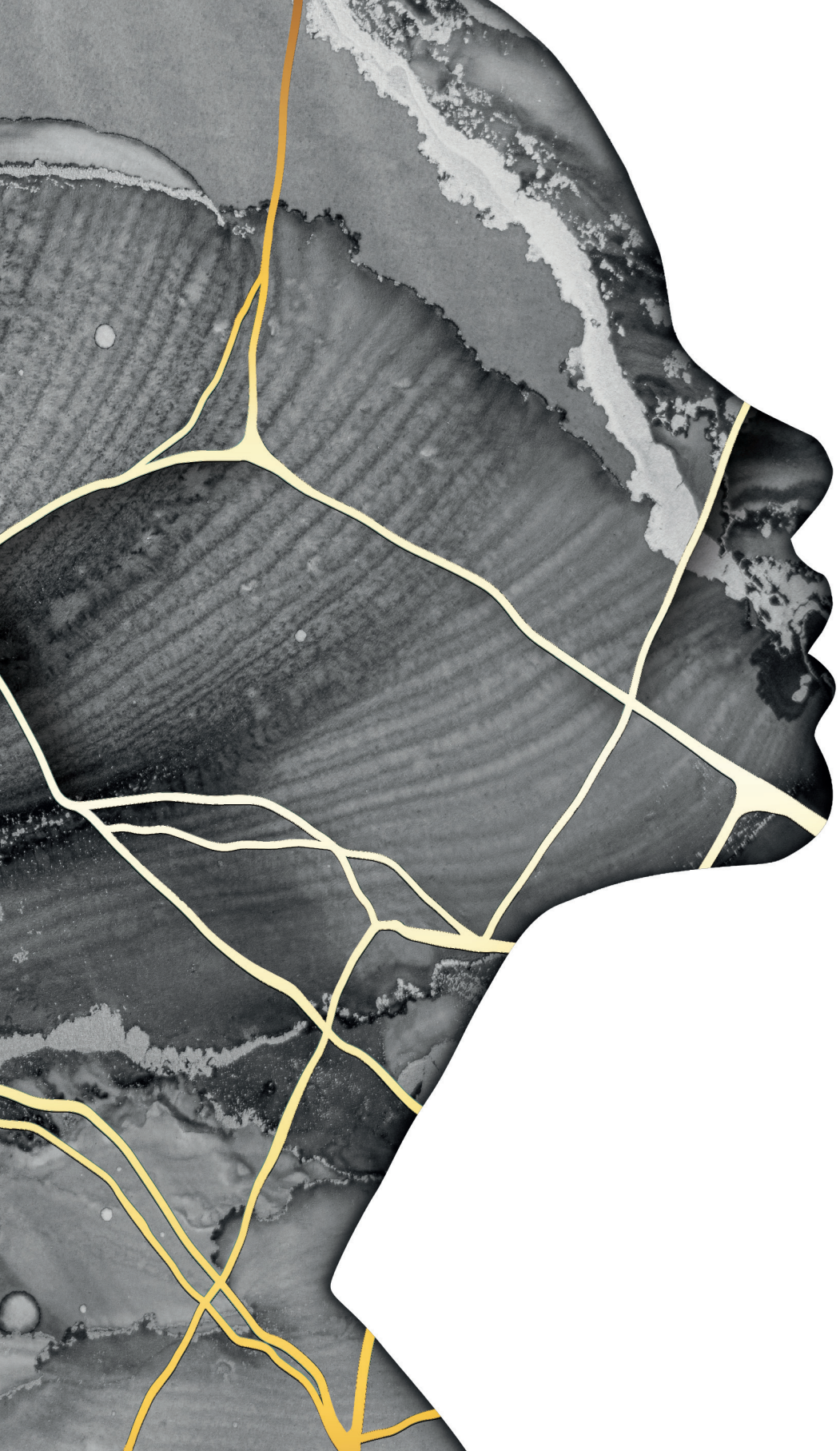
21. Teunissen PW, Scheele F, Scherpbier AJJA, et al. How residents learn: qualitative evidence for the pivotal role of clinical activities. Medical Education. 2007;41(8):763-770. doi:10.1111/j.1365-2923.2007.02778.x
22. Burlew CC. Surgical education: Lessons from parenthood. American journal of surgery. Published online September 2017. doi:10.1016/j.amjsurg.2017.09.014
23. Shepherd L, Chilton S, Cristancho SM. Residents, Responsibility, and Error: How Residents Learn to Navigate the Intersection. Academic Medicine. 2023;98(8):934-940. doi:10.1097/ACM.0000000000005267
24. Brooks R, Goldstein S. Raising Resilient Children: A Curriculum to Foster Strength, Hope, and Optimism in Children.; 2002. doi:10.3109/09638237.2011.613958
25. Klasen JM, Teunissen PW, Driessen E, Lingard LA. Trainees' perceptions of being allowed to fail in clinical training: A sense-making model. Medical Education. 2023;57(5):430-439. doi:10.1111/medu.14966
26. Wu AW, Folkman S, McPhee SJ, Lo B. Do house officers learn from their mistakes? JAMA. 1991;265(16):2089-2094.
27. Fischer MA, Mazor KM, Baril J, Alper E, DeMarco D, Pugnaire M. Learning from mistakes: Factors that influence how students and residents learn from medical errors. J Gen Intern Med. 2006;21(5):419-423. doi:10.1111/j.1525-1497.2006.00420.x
28. Bradley CK, Fischer MA, Walsh KE. Trends in medical error education: Are we failing our residents? Academic Pediatrics. 2013;13(1):59-64. doi:10.1016/j.acap.2012.10.004
29. Scott IA. Errors in clinical reasoning: causes and remedial strategies. BMJ. 2009;338(jun08 2):b1860-b1860. doi:10.1136/bmj.b1860
30. Scott IA, Hubbard RE, Crock C, Campbell T, Perera M. Developing critical thinking skills for delivering optimal care. Internal Medicine Journal. 2021;51(4):488-493. doi:10.1111/imj.15272
31. Mamede S, Schmidt HG, Rikers R. Diagnostic errors and reflective practice in medicine. J Eval Clin Pract. 2007;13(1):138-145. doi:10.1111/j.1365-2753.2006.00638.x
32. Khoushhal Z, Hussain MA, Greco E, et al. Prevalence and Causes of Attrition Among Surgical Residents: A Systematic Review and Meta-analysis. JAMA Surg. 2017;152(3):265. doi:10.1001/jamasurg.2016.4086
33. Robinson DBT, Luton O, Mellor K, et al. Trainee perspective of the causes of stress and burnout in surgical training: a qualitative study from Wales. BMJ Open. 2021;11(8):e045150. doi:10.1136/bmjopen-2020-045150
34. Jesuyajolu D, Nicholas A, Okeke C, et al. Burnout among surgeons and surgical trainees: A systematic review and meta-analysis of the prevalence and associated factors. Surgery in Practice and Science. 2022;10:100094. doi:10.1016/j.sipas.2022.100094
35. Han R, Hahn E, Done SJ, Pun C, Shivji S, Lu FI. Resident Depression and Burnout During the COVID-19 Pandemic: A Survey of Canadian Laboratory Medicine Trainees. Archives of Pathology & Laboratory Medicine. 2023;147(3):368-375. doi:10.5858/arpa.2021-0501-EP
36. Johnstone J, Gabara A, Hopman WM, Touma NJ. Impact of the COVID-19 pandemic on the burnout rates of graduating Canadian Urology residents. BJU International. 2022;130(3):389-393. doi:10.1111/bju.15834
37. Mion G, Hamann P, Saleten M, Plaud B, Baillard C. Psychological impact of the COVID-19 pandemic and burnout severity in French residents: A national study. The European Journal of Psychiatry. 2021;35(3):173-180. doi:10.1016/j.ejpsy.2021.03.005
38. Bynum WE, Goodie JL. Shame, guilt, and the medical learner: ignored connections and why we should care. Med Educ. 2014;48(11):1045-1054. doi:10.1111/medu.12521
39. Bynum WE, Artino AR, Uijtdehaage S, Webb AMB, Varpio L. Sentinel Emotional Events: The Nature, Triggers, and Effects of Shame Experiences in Medical Residents. Academic Medicine. 2019;94(1):85-93. doi:10.1097/ACM.0000000000002479
40. Krasner MS. Association of an Educational Program in Mindful Communication With Burnout, Empathy, and Attitudes Among Primary Care Physicians. JAMA. 2009;302(12):1284. doi:10.1001/jama.2009.1384

41. Klasen JM. It Hurts Whether You Fail or Not. Academic Medicine. 2020;95(8):1207-1207. doi:10.1097/ACM.0000000000003467
42. Edmondson A. Psychological Safety and Learning Behavior in Work Teams. Administrative Science Quarterly. 1999;44(2):350-383. doi:10.2307/2666999
43. Jung OS, Kundu P, Edmondson AC, et al. Resilience vs. Vulnerability: Psychological Safety and Reporting of Near Misses with Varying Proximity to Harm in Radiation Oncology. The Joint Commission Journal on Quality and Patient Safety. 2021;47(1):15-22. doi:10.1016/j.jcjq.2020.09.005
44. Molloy E, Bearman M. Embracing the tension between vulnerability and credibility: 'intellectual candour' in health professions education. Medical Education. 2019;53(1):32-41. doi:10.1111/medu.13649
45. Kelly M, Lynch J, Mainstone P, Green A, Sturman N. 'Things we are expected to just do and deal with': Using the medical humanities to encourage reflection on vulnerability and nurture clinical skills, collegiality, compassion, and self-care. Perspect Med Educ. 2022;11(5):1-5. doi:10.1007/S40037-022-00724-W
46. Piemonte NM. Afflicted: How Vulnerability Can Heal Medical Education and Practice. 1st ed. The MIT Press; 2018. doi:10.7551/mitpress/9780262037396.001.0001
47. Brown B. Daring Greatly: How the Courage to Be Vulnerable Transforms the Way We Live, Love, Parent, and Lead. First trade paperback printing. Avery; 2015.
48. Moudatsou M, Stavropoulou A, Philalithis A, Koukouli S. The Role of Empathy in Health and Social Care Professionals. Healthcare. 2020;8(1):26. doi:10.3390/healthcare8010026
49. Molloy E, Boud D, Henderson M. Developing a learning-centred framework for feedback literacy. Assessment & Evaluation in Higher Education. 2020;45(4):527-540. doi:10.1080/02602938.2019.1667955
50. Watling CJ, Ginsburg S. Assessment, feedback and the alchemy of learning. Med Educ. 2019;53(1):76-85. doi:10.1111/medu.13645
51. Gin BC, Tsoi S, Sheu L, Hauer KE. How supervisor trust affects early residents' learning and patient care: A qualitative study. Perspect Med Educ. 2021;10(6):327-333. doi:10.1007/s40037-021-00674-9
52. Sheu L, Kogan JR, Hauer KE. How Supervisor Experience Influences Trust, Supervision, and Trainee Learning: A Qualitative Study. Academic Medicine. 2017;92(9):1320-1327. doi:10.1097/ACM.0000000000001560
53. Penner JC, Hauer KE, Julian KA, Sheu L. How preceptors develop trust in continuity clinic residents and how trust influences supervision: A qualitative study. Perspect Med Educ. 2021;11(2):73-79. doi:10.1007/S40037-021-00694-5
54. Applefield, James. M., Huber, R., & Moallem, M. (2000). Constructivism in Theory and Practice: Toward a Better Understanding. The High School Journal, 84(2), 35–53. http://www.jstor.org/stable/40364404.
55. Tavares W, Eppich W, Cheng A, et al. Learning Conversations: An Analysis of the Theoretical Roots and Their Manifestations of Feedback and Debriefing in Medical Education. Academic Medicine. 2020;95(7):1020-1025. doi:10.1097/ACM.0000000000002932
56. Osta AD, King MA, Serwint JR, Bostwick SB. Implementing Emotional Debriefing in Pediatric Clinical Education. Academic Pediatrics. 2019;19(3):278-282. doi:10.1016/j.acap.2018.10.003
57. Harder N, Lemoine J, Harwood R. Psychological outcomes of debriefing healthcare providers who experience expected and unexpected patient death in clinical or simulation experiences: A scoping review. Journal of Clinical Nursing. 2020;29(3-4):330-346. doi:10.1111/jocn.15085
58. Gunasingam N, Burns K, Edwards J, Dinh M, Walton M. Reducing stress and burnout in junior doctors: the impact of debriefing sessions. Postgraduate Medical Journal. 2015;91(1074):182-187. doi:10.1136/postgradmedj-2014-132847
59. Eppich WJ, Hunt EA, Duval-Arnould JM, Siddall VJ, Cheng A. Structuring Feedback and Debriefing to Achieve Mastery Learning Goals: Academic Medicine. 2015;90(11):1501-1508. doi:10.1097/ACM.0000000000000934

60. Ramani S, Krackov SK. Twelve tips for giving feedback effectively in the clinical environment. Medical Teacher. 2012;34(10):787-791. doi:10.3109/0142159X.2012.684916
61. Ramani S, Leinster S. AMEE Guide no. 34: teaching in the clinical environment. Medical Teacher. 2008;30(4):347-364. doi:10.1080/01421590802061613
62. Irby DM, Cooke M, O'Brien BC. Calls for Reform of Medical Education by the Carnegie Foundation for the Advancement of Teaching: 1910 and 2010: Academic Medicine. 2010;85(2):220-227. doi:10.1097/ACM.0b013e3181c88449
63. Irby DM. Excellence in clinical teaching: knowledge transformation and development required. Medical Education. 2014;48(8):776-784. doi:10.1111/medu.12507
64. Beauchamp TL, Childress JF. Principles of Biomedical Ethics. 5th ed. Oxford University Press; 2001.
65. Varkey B. Principles of Clinical Ethics and Their Application to Practice. Med Princ Pract. 2021;30(1):17-28. doi:10.1159/000509119
66. Andersson H, Svensson A, Frank C, Rantala A, Holmberg M, Bremer A. Ethics education to support ethical competence learning in healthcare: an integrative systematic review. BMC Med Ethics. 2022;23(1):29. doi:10.1186/s12910-022-00766-z
67. Entwistle VA, Carter SM, Cribb A, McCaffery K. Supporting Patient Autonomy: The Importance of Clinician-patient Relationships. J GEN INTERN MED. 2010;25(7):741-745. doi:10.1007/s11606-010-1292-2
68. Subramani S, Biller-Andorno N. Revisiting respect for persons: conceptual analysis and implications for clinical practice. Med Health Care and Philos. 2022;25(3):351-360. doi:10.1007/s11019-022-10079-y
69. Lewis J. Respect for autonomy: Consent doesn't cut it. Clinical Ethics. 2023;18(2):139-141. doi:10.1177/14777509231173572
70. Walton M, Kerridge I. Do no harm: Is it time to rethink the Hippocratic Oath? Medical Education. 2014;48(1):17-27. doi:10.1111/medu.12275
71. Bester JC. Beneficence, Interests, and Wellbeing in Medicine: What It Means to Provide Benefit to Patients. The American Journal of Bioethics. 2020;20(3):53-62. doi:10.1080/15265161.2020.1714793
72. DeGrazia D, Millum J. A Theory of Bioethics. 1st ed. Cambridge University Press; 2021. doi:10.1017/9781009026710
73. Coulter A, Ellins J. Effectiveness of strategies for informing, educating, and involving patients. BMJ. 2007;335(7609):24-27. doi:10.1136/bmj.39246.581169.80
74. Rowland P, Anderson M, Kumagai AK, McMillan S, Sandhu VK, Langlois S. Patient involvement in health professionals' education: a meta-narrative review. Adv in Health Sci Educ. 2019;24(3):595-617. doi:10.1007/s10459-018-9857-7
75. Olejarczyk JP, Young M. Patient Rights and Ethics. [Updated 2022 Nov 28]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK538279/.
76. Satyanarayana Rao K. Informed consent: An ethical obligation or legal compulsion? J Cutan Aesthet Surg. 2008;1(1):33. doi:10.4103/0974-2077.41159
77. Lane AS, Roberts C. Phenomenological study of medical interns reflecting on their experiences, of open disclosure communication after medication error: linking rationalisation to the conscious competency matrix. BMJ Open. 2020;10(5):e035647. doi:10.1136/bmjopen-2019-035647
78. Carrillo I, Mira JJ, Guilabert M, Lorenzo S, On behalf of the Second and Third Victim Research Group. Why an Open Disclosure Procedure Is and Is not Followed After an Avoidable Adverse Event. J Patient Saf. 2021;17(6):e529-e533. doi:10.1097/PTS.0000000000000405
79. Gallagher TH, Waterman AD, Ebers AG, Fraser VJ, Levinson W. Patients' and Physicians' Attitudes Regarding the Disclosure of Medical Errors. JAMA. 2003;289(8):1001. doi:10.1001/jama.289.8.1001
80. Kaldjian LC, Jones EW, Wu BJ, Forman-Hoffman VL, Levi BH, Rosenthal GE. Disclosing Medical Errors to Patients: Attitudes and Practices of Physicians and Trainees. J GEN INTERN MED. 2007;22(7):988-996. doi:10.1007/s11606-007-0227-z

81. Gordon GH. Disclosing Error to a Patient: Physician-to-Patient Communication. AMA Journal of Ethics. 2005;7(8). doi:10.1001/virtualmentor.2005.7.8.ccas1-0508
82. Wolf ZR, Hughes RG. Error Reporting and Disclosure. In: Hughes RG, editor. Patient Safety and Quality: An Evidence-Based Handbook for Nurses. Rockville (MD): Agency for Healthcare Research and Quality (US); 2008 Apr. Chapter 35. Available from: https://www.ncbi.nlm.nih.gov/books/NBK2652/.
83. Mansour R, Ammar K, Al-Tabba A, Arawi T, Mansour A, Al-Hussaini M. Disclosure of medical errors: physicians' knowledge, attitudes and practices (KAP) in an oncology center. BMC Med Ethics. 2020;21(1):74. doi:10.1186/s12910-020-00513-2
84. Emmerton-Coughlin H, Schlachta C, Lingard L. 'The other right': control strategies and the role of language use in laparoscopic training. Med Educ. 2017;51(12):1269-1276. doi:10.1111/medu.13420
85. Doobay-Persaud A, Ngongo W, Whitfield S, Saffran L. Power and Language in Medical Education. Journal of Health Care for the Poor and Underserved. 2020;31(4S):120-127. doi:10.1353/hpu.2020.0143
86. Lingard L. Language matters: towards an understanding of silence and humour in medical education: Language matters. Medical Education. 2013;47(1):40-48. doi:10.1111/medu.12098
87. Pinker S. The Language Instinct: How the Mind Creates Language. Nachdr. Harper Perennial; 2010.
88. Kapur M. Productive Failure. Cognition and Instruction. 2008;26(3):379-424. doi:10.1080/07370000802212669
89. Sinha T, Kapur M. When Problem Solving Followed by Instruction Works: Evidence for Productive Failure. Review of Educational Research. 2021;91(5):761-798. doi:10.3102/00346543211019105
90. Steenhof N, Woods NN, Mylopoulos M. Exploring why we learn from productive failure: insights from the cognitive and learning sciences. Adv in Health Sci Educ. 2020;25(5):1099-1106. doi:10.1007/s10459-020-10013-y
91. Lingard L, Sayra Cristancho S, Hennel EK, St-Onge C, Van Braak M. When English clashes with other languages: Insights and cautions from the Writer's Craft series. Perspect Med Educ. 2021;10(6):347-351. doi:10.1007/S40037-021-00689-2
92. Helmich E, Cristancho S, Diachun L, Lingard L. 'How would you call this in English?': Being reflective about translations in international, cross-cultural qualitative research. Perspect Med Educ. 2017;6(2):127-132. doi:10.1007/s40037-017-0329-1
93. https://dictionary.cambridge.org/dictionary/english.
94. Levine MG. The Subject is Taboo. MLN. 1986;101(5):977. doi:10.2307/2905707
95. Freud S, Strachey J, Freud S. Totem and Taboo: Some Points of Agreement between the Mental Lives of Savages and Neurotics. W.W. Norton; 1989.
96. Drake P. Grasping at methodological understanding: a cautionary tale from insider research. International Journal of Research & Method in Education. 2010;33(1):85-99. doi:10.1080/17437271003597592
97. Horsfall M, Eikelenboom M, Draisma S, Smit JH. The Effect of Rapport on Data Quality in Face-to-Face Interviews: Beneficial or Detrimental? IJERPH. 2021;18(20):10858. doi:10.3390/ijerph182010858
98. McGrath C, Palmgren PJ, Liljedahl M. Twelve tips for conducting qualitative research interviews. Medical Teacher. 2019;41(9):1002-1006. doi:10.1080/0142159X.2018.1497149
99. Garbarski D, Schaeffer NC, Dykema J. Interviewing Practices, Conversational Practices, and Rapport: Responsiveness and Engagement in the Standardized Survey Interview. Sociological Methodology. 2016;46(1):1-38. doi:10.1177/0081175016637890
100. Tickle-Degnen L, Rosenthal R. The Nature of Rapport and Its Nonverbal Correlates. Psychological Inquiry. 1990;1(4):285-293. doi:10.1207/s15327965pli0104_1
101. Watling CJ, Ajjawi R, Bearman M. Approaching culture in medical education: Three perspectives. Medical Education. 2020;54(4):289-295. doi:10.1111/medu.14037
102. Kennedy TJT, Regehr G, Baker GR, Lingard LA. Progressive independence in clinical training: a tradition worth defending? Academic medicine : journal of the Association of American Medical Colleges. 2005;80(10):106-111. doi:10.1097/00001888-200510001-00028

103. Ilgen JS, de Bruin ABH, Teunissen PW, Sherbino J, Regehr G. Supported Independence: The Role of Supervision to Help Trainees Manage Uncertainty. Academic Medicine. 2021;96(11S):S81-S86. doi:10.1097/ACM.0000000000004308
104. Cassidy DJ, McKinley SK, Ogunmuyiwa J, et al. Surgical autonomy: A resident perspective and the balance of teacher development with operative independence. The American Journal of Surgery. 2021;221(2):336-344. doi:10.1016/j.amjsurg.2020.10.024
105. Atkinson RB, Smink DS. Allowing failure so trainees can thrive: the importance of guided autonomy in medical education. BMJ Qual Saf. Published online February 21, 2020:bmjqs-2019-010673. doi:10.1136/bmjqs-2019-010673
106. https://Centreforfacdev.ca/Workshop-Catalogue/308-Failure-in-Training-Powerful-and-Productive-or-Demoralizing-and-Counterproductive/
107. Klasen JM, Germann N, Lutz S, Beck J, Fourie L. Breaking the Silence: A Workshop for Medical Students on Dealing With Failure in Medicine. Acad Med. Published online August 31, 2023. doi:10.1097/ACM.0000000000005438
108. Lynch J, Orsino A, Kawamura A. Productive struggle and failing safely: implications for developing adaptive expertise in communication. Adv in Health Sci Educ. 2022;27(5):1331-1344. doi:10.1007/s10459-022-10175-x
109. Bezemer J, Murtagh G, Cope A, Kneebone R. Surgical decision making in a teaching hospital: a linguistic analysis: Surgical decision making. ANZ J Surg. 2016;86(10):751-755. doi:10.1111/ans.12824



Summary

In the realm of medical education, the concept of allowing failure as an unspoken pedagogy in residency training holds profound significance. By embracing the idea that residents may encounter failures and setbacks during their clinical journey, supervisors pave the way for critical learning experiences. These moments of allowed failure, when handled constructively, become powerful tools for learning and growth. Acknowledging that failure is a natural part of the learning process may encourage residents to take risks, ask questions, and seek improvement. It fosters a culture of open communication and psychological safety, ultimately enabling residents to become more confident, competent, and compassionate physicians. This thesis explores the essential role of allowing failure as a supervisory strategy within the context of residency training, highlighting its potential to shape the next generation of physicians.

Chapter 1 establishes the contextual backdrop by examining how failure has been defined both within and beyond the health professions literature. It sets the stage for the thesis's primary focus on the concept of allowing failure within postgraduate medical training. While failure is conventionally associated with negative outcomes, particularly in clinical scenarios where it can lead to life-threatening consequences, it also holds the potential to positively impact learning. However, there is a dearth of research on optimizing learning from failure in clinical environments, likely because of its inherent threat to patient safety. This chapter introduces key concepts related to the role of failure in cognitive aspects of learning, including desirable difficulties, the challenge point framework, and productive failure. Recognizing the need to strike a balance between the severity of failure and the value of learning, especially in medicine, this chapter emphasizes that cultural and educational contexts can either hinder or facilitate the effective use of failure as a learning opportunity. Moreover, it highlights the pivotal role of supervisors in optimizing learning from failure. The research program seeks to understand this practice by investigating factors influencing clinical supervisors' judgment regarding the appropriateness of allowing failure to promote trainee learning without compromising patient outcomes. Setting the stage for this exploration, the first chapter introduces the central research questions: (1) What does existing medical education literature reveal about the practice of permitting failure during clinical supervision, including its key findings, gaps, and implications for future research and practice? (2) Under what circumstances, by what means, and for what reasons do clinical educators intentionally allow failure as an educational strategy? (3) How do residents perceive and experience permitted failure in their training?

Chapter 2 sought to ascertain what is already available in the medical education literature about this supervisory practice, preparatory to further empirical investigation. Using a critical narrative review methodology of relevant publications from a broad range of literatures, this chapter identifies key findings and maps these into four categories: 1) learning from failure in clinical training and 2) in clinical practice in general, 3) learning from failure in other educational settings, and 4) patient safety culture with its implications for learning from failure. Only a small set of papers addressed issues closely related to our research question, such as how and what residents learn from the clinical errors they make. No publications directly addressed the precise phenomenon of clinical supervisors allowing residents to fail as an educational strategy. This suggests an intriguing gap in the literature. However, it may also highlight potential challenges in exploring this phenomenon empirically, including participant reluctance to share information about a practice that, at least on the face of it, runs counter to their dominant professional culture that strongly values patient safety.

Chapter 3 delves into the supervisory practices of allowing trainee failure in clinical training settings. Employing a constructivist grounded theory approach, I interviewed clinical supervisors from various backgrounds and institutions, asking them about the supervisory strategy of allowing trainees to fail in clinical circumstances for teaching purposes. Clinical supervisors recounted instances of allowing failure, including failures during clinical training that naturally occurred and were not actively prevented, as well as error promotion, where supervisors intentionally introduced challenges to provoke errors or guide learners toward specific mistakes. They also described educational and emotional impact of failure on trainees. The qualitative content analysis systematically described the dominant features of the phenomenon, culminating in a preliminary definition. I present along with it the conditions and circumstances, the type of clinical performance, the potential consequences, and the strategies that can be put in place to maximize trainee learning and avoid patient harm. The study highlighted the need for a deeper understanding of how supervisors navigate this balance and the types of failures deemed permissible for learning.

The intention of **Chapter 4** is to elaborate on the judgment and decision-making process of the supervisors as they allow trainee failure in clinical settings. This constructivist grounded theory study offers insights that supervisors' judgments to allow failure were characterized as intuitive, spontaneous, and potentially even subconscious. We attempted to construct a model elucidating the interconnections among the variables in order to comprehend the rationale behind allowing failure in certain circumstances while preventing it in others. However, through this attempt I arrived at the conclusion that the response is contingent upon several aspects: in short, "it depends". This observation suggests that the interaction between patient, trainee, supervisor, and environmental elements is dynamic and non-linear. Moreover, these interactions occur without the supervisor's conscious awareness and are not readily observable to researchers. Reflecting this insight, we refined our original definition (from Chapter 2) as follows: "While supervising a trainee's clinical performance, the supervisor, influenced by both intuition and a non-linear interplay of different factors, detects an imminent trainee mistake, has the opportunity to intervene but chooses not to do so, because the educational gain for the trainee is perceived to outweigh the (potential) consequences for the patient." This refined definition we built around it has contributed to a growing recognition within the medical education field regarding the non-linear nature of supervisory practices.

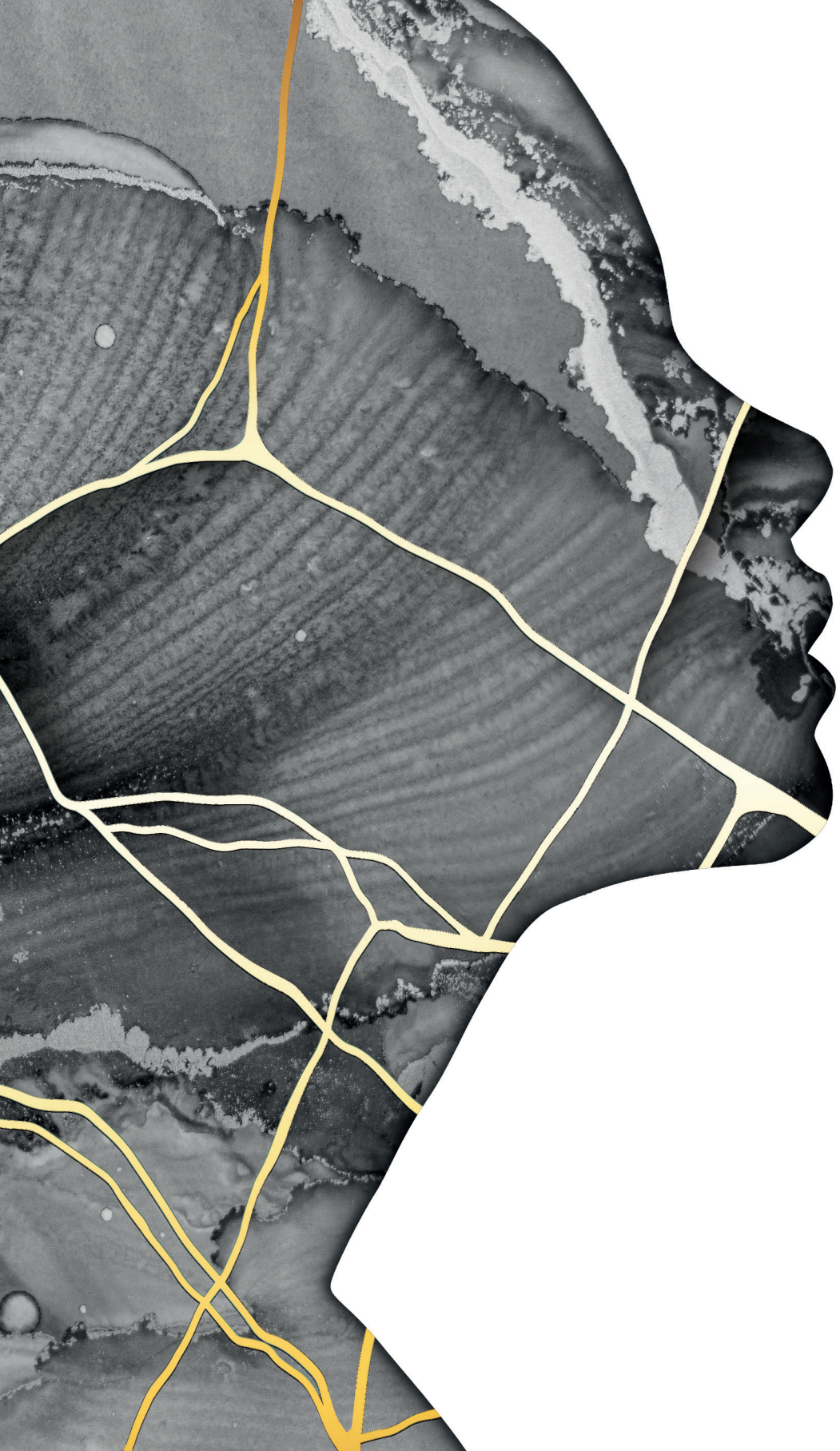
As our research revealed that our phenomenon of interest might be understood differently in different clinical contexts, **Chapter 5's** focuses on how environment and organizational structure might influence the supervisory practice of allowing failure in the postgraduate setting. This qualitative, single-center study was set in pediatrics, with the goal of understanding pediatric hospitalists' intentions to allow trainee failure during clinical encounters. Almost all participants, as in our earlier, multi-specialty study, stated that they consciously accepted and used allowing failure as a teaching approach, recognizing its emotional power and weighing the educational advantages against the risks to patients, care givers, and trainees. The developed model describes the procedure they follow for allowing failure, which includes establishing an orientation, analyzing factors impacting decision-making, and learning conversations with trainees, which contributed to an extended understanding of the phenomenon. In this study, participants did not explicitly alert trainees to this teaching strategy, and they avoided using the term "failure" during the learning conversations to protect trainees from the perceived psychological harm associated with that term.

Chapter 6 shifts the focus to trainees' perceptions and experiences of allowed failure in clinical training, investigating their awareness of the phenomenon and their sense of the emotional and educational value of failure. This constructivist grounded theory study found that trainees know that their supervisors sometimes allow them to fail. They saw these mistakes as potentially helpful for learning, but whether they realized that potential was dependent on how they understood the event. Trainees were left alone to make meaning of their failure

situations due to a lack of explicit dialogue with supervisors. When they concluded that they had been allowed to fail, their assessment of the event was influenced by their attribution of supervisor purpose, raising the question of whether perceived intent influenced the educational benefit or potential harm of the experience. This sense-making determined whether the learner perceived the allowed failure experience to be constructive or destructive. As a result, the chapter presents a model of this sense-making.

Returning to the idea of non-linearity, **Chapter 7** explores the "butterfly effect" within the complex, dynamic, social phenomenon of clinical supervision. It underscores the significance of recognizing that interactions among clinicians, trainees, and patients are inherently non-linear, challenging conventional linear assumptions prevalent in medical education. I argue that researchers grappling with this complexity must broaden their conceptual framework to incorporate non-linearity, akin to the butterfly's wing – a silent instigator of change. Only with such an expanded perspective will we be able to explore supervisory interactions that lack explicit, visible or audible cues: the apparently invisible disruptions in the supervisory dynamic. By acknowledging and providing a vocabulary for these disruptions, researchers may gain insight into how non-linearity impacts trainee learning and patient safety. The chapter asserts that although non-linearity can be unsettling for researchers, it is imperative to resist falling into linear assumptions when describing dynamic phenomena like clinical supervision and entrustment.

Chapter 8 synthesizes the findings from this research program, elucidates their connections with the health professions literature, and presents several avenues for future investigations. I also reflect on the primary challenges encountered during the research program, particularly in light of the topic's sensitivity and the impact of language. Following this, I address both the potential limitations and strengths of this thesis. To conclude, I offer multiple recommendations for future explorations aimed at investigating the phenomenon of allowing failure from diverse epistemological perspectives, employing various data collection methods, and examining distinct contextual factors.



Samenvatting

Samenvatting

Dit proefschrift onderzoekt het door supervisoren toestaan van het falen van specialisten in opleiding en gaat na wanneer en waarom opleiders deze strategie bewust inzetten om het leren mee te sturen. In het domein van het medisch onderwijs heeft falen een beladen betekenis voor alle betrokkenen: lerende, begeleider, patient, team. Het gebruik van gesuperviseerd falen in de opleiding van medische specialisten is een onuitgesproken pedagogische benadering die verder onderzoek vereist. Door het idee te omarmen dat specialisten in opleiding fouten maken en tegenslagen kunnen ervaren tijdens hun klinische reis, kunnen opleiders wellicht ruimte creëren voor kritische leerervaringen. Deze momenten waarbij mislukking juist toegestaan is, zouden, mits constructief aangepakt, krachtige leermiddelen kunnen zijn. Het erkennen dat falen een natuurlijk onderdeel is van het leerproces kan specialisten in opleiding aanmoedigen om risico's te nemen, vragen te stellen en naar verbetering te zoeken. Het bevordert een cultuur van open communicatie en psychologische veiligheid, waardoor specialisten in opleiding uiteindelijk zelfverzekerder, bekwamer en empathischer zullen worden als artsen. Anderzijds zijn er risico's verbonden aan deze strategie. Deze risico's betreffen onder andere patiëntveiligheid, de relatie tussen specialist in opleiding en supervisor, psychologische effecten op alle betrokkenen en mogelijk negatieve culturele gevolgen.

Hoofdstuk 1 beschrijft hoe falen zowel binnen als buiten het medische vakgebied in de literatuur is gedefinieerd. Het bereidt de primaire focus van dit proefschrift over het concept van toegestaan falen binnen de medische vervolgopleiding voor. Hoewel falen conventioneel wordt geassocieerd met negatieve uitkomsten, met name in klinische scenario's waar het kan leiden tot levensbedreigende gevolgen, heeft het ook het potentieel om positief van invloed te zijn op het leren. Er is echter een gebrek aan onderzoek naar het optimaliseren van leren van falen in klinische omgevingen, mogelijk vanwege het inherente gevaar voor de patiëntveiligheid. Dit hoofdstuk introduceert belangrijke concepten met betrekking tot de rol van falen vanuit een cognitief perspectief op leren. Dit hoofdstuk erkent de noodzaak om een balans te vinden tussen de ernst van mislukkingen en de waarde van leren, vooral in de geneeskunde, en benadrukt dat culturele en educatieve contexten het effectieve gebruik van falen als leermogelijkheid kunnen belemmeren of juist vergemakkelijken. Bovendien gaat het in op de cruciale rol van supervisoren bij het leren van falen. Het onderzoeksprogramma beoogt deze praktijk te begrijpen door factoren te onderzoeken die klinische supervisors meewegen bij het wel of niet toestaan van falen in het leerproces van specialisten in opleiding. Een belangrijke factor die daarbij

aandacht krijgt is het effect van deze strategie op de patiëntveiligheid. In het eerste hoofdstuk worden de centrale onderzoeksvragen geïntroduceerd: (1) Wat zegt de huidige literatuur over medisch onderwijs over het toestaan van falen tijdens klinische supervisie, inclusief de belangrijkste bevindingen, hiaten en implicaties voor toekomstig onderzoek en praktijk? (2) Onder welke omstandigheden, met welke middelen en om welke redenen staan supervisoren van specialisten in opleiding falen toe als onderwijsstrategie? (3) Hoe ervaren specialisten in opleiding het wanneer zij situaties van gesuperviseerd falen ervaren tijdens hun opleiding?

Hoofdstuk 2 gaat in op de beschikbare literatuur in het medisch onderwijsdomein over gesuperviseerd falen door specialisten in opleiding. Met behulp van een kritische narratieve review methode van relevante publicaties, identificeert dit hoofdstuk belangrijke bevindingen en brengt deze in kaart in vier categorieën: 1) leren van falen in klinische training, 2) in de algemene klinische praktijk, 3) leren van falen in andere educatieve omgevingen en 4) implicaties voor leren van falen op patiëntveiligheid. Slechts een klein aantal publicaties behandelden kwesties die nauw verband hielden met onze onderzoeksvraag, zoals hoe en wat specialisten in opleiding leren van de klinische fouten die ze maken. Geen publicaties behandelden rechtstreeks het precieze fenomeen van klinische supervisors die specialisten in opleiding toestaan om te falen als een educatieve strategie. Dit suggereert een intrigerend hiaat in de literatuur.

Hoofdstuk 3 onderzoekt de perspectieven van supervisoren op het toestaan van specialisten in opleiding om te falen in klinische opleidingsituaties. Met behulp van een constructivist grounded theory-benadering heb ik klinische supervisors geïnterviewd uit verschillende achtergronden en instellingen, waarbij ik hen vroeg naar de afwegingenom specialisten in opleiding voor educatieve doeleinden toe te staan te falen. De geïnterviewden vertelden over gevallen van, door hen toegestaan, falen van specialisten in opleiding. Daaronder vielen tevens mislukte pogingen zelfstandig een handeling te verrichten die van nature plaatsvonden en niet actief werden voorkomen, evenals situaties waarbij supervisoren opzettelijk uitdagingen introduceerden om fouten uit te lokken of specialisten in opleiding naar specifieke fouten te sturen. Ze beschreven ook het, door hen ervaren, educatieve en emotionele effect van falen op de leerlingen. Op basis van analyse van deze gegevens beschrijf ik systematisch de dominante kenmerken van het fenomeen, resulterend in een voorlopige definitie. Ik presenteer, samen met de voorwaarden en omstandigheden, het type klinische prestatie, de mogelijke gevolgen en de strategieën die worden toegepast om het leren te maximaliseren en schade aan patiënten te voorkomen. Deze studie

benadrukt de noodzaak van een dieper begrip van hoe supervisors deze balans bewaken en welk soorten falen als toelaatbaar word beschouwd voor leren.

Doel van **hoofdstuk 4** is om het oordeel en het besluitvormingsproces van supervisoren uit te die specialisten in opleiding toestaan te falen verder te doorgronden. Deze constructive grounded theory-studie laat zien dat de oordelen van supervisoren om falen toe te staan zich kenmerken als intuïtief, spontaan en mogelijk zelfs onbewust. Ik heb een model opgesteld om de denkwijze achter het toestaan of voorkomen van gesuperviseerd falen in bepaalde omstandigheden te begrijpen. Het werd duidelijk dat deze afweging afhangt van aspecten zoals de interactie tussen patiënt, specialist in opleiding, supervisor en omgevingsfactoren die dynamisch en niet-lineair is. Bovendien gebeuren deze afwegingen veelal in het onderbewustzijn van de supervisor en zijn daarom niet waarneembaar voor onderzoekers. Met deze inzichten in gedachten, hebben we onze oorspronkelijke definitie (uit Hoofdstuk 2) van toegestaan falen als volgt verfijnd: “Terwijl zij de klinische prestaties van een leerling superviseert, detecteert de supervisor, beïnvloed door zowel intuïtie alsmede een niet-lineaire wisselwerking van verschillende factoren, een aanstaande fout van de specialist in opleiding en heeft de mogelijkheid om in te grijpen, maar kiest ervoor dit niet te doen, omdat het educatieve voordeel voor de lerende wordt gezien als groter dan de (potentiële) gevolgen voor de patiënt.”

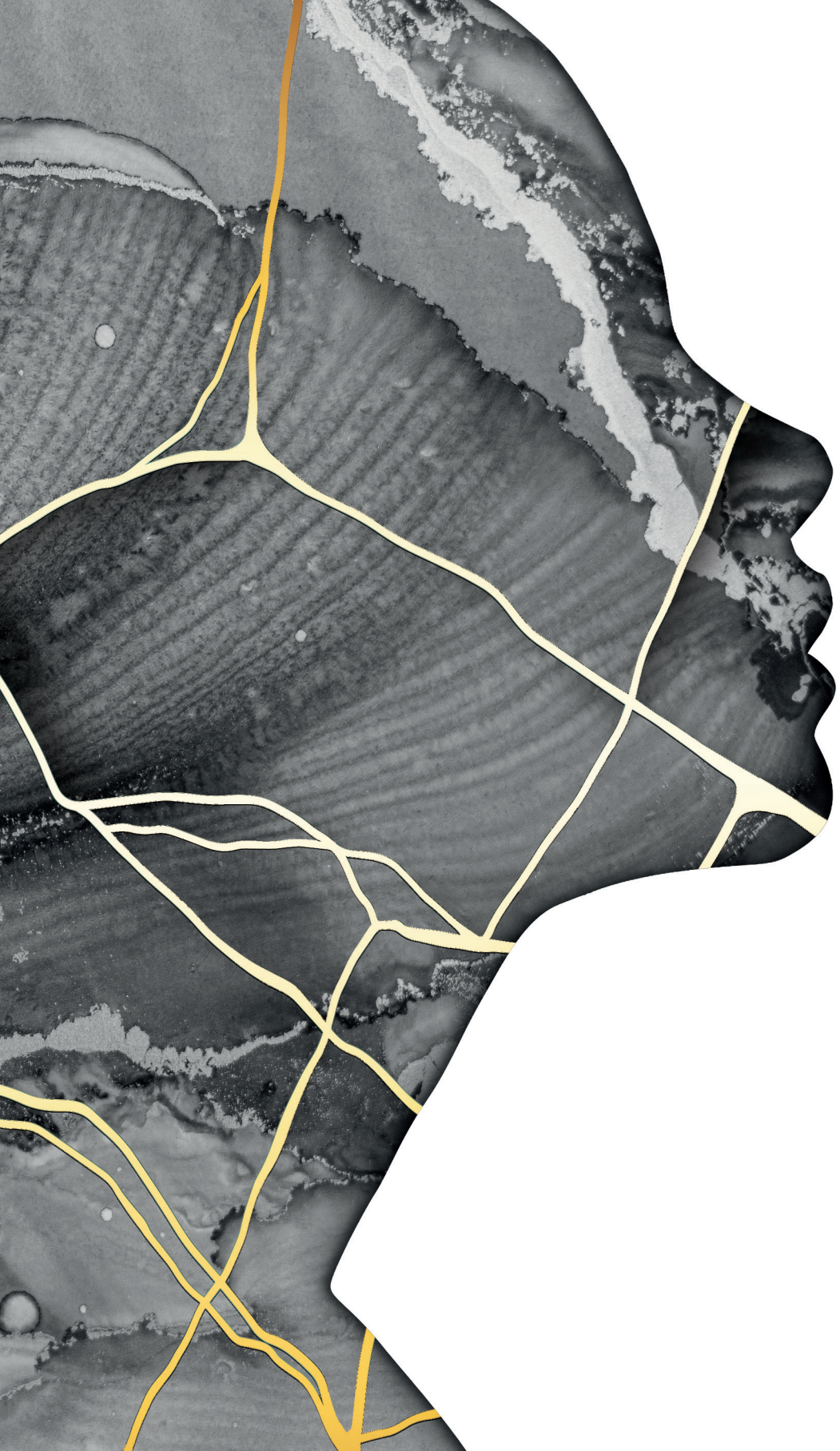
Hoofdstuk 5 richt zich op hoe de omgeving en organisatiestructuur de praktijk van het toestaan van falen in de opleiding tot specialist kunnen beïnvloeden. Deze kwalitatieve, single-center studie in de kindergeneeskunde, heeft als doel de intenties van kinderartsen te begrijpen om falen voor kinderartsen in opleiding toe te staan in de kliniek. Net zoals in onze eerdere multidisciplinaire studie, verklaarden bijna alle deelnemers dat ze het falen bewust accepteerden en gebruikten als een onderwijsbenadering, waarbij ze de emotionele kracht erkenden en de educatieve voordelen afwogen tegen de risico’s voor patiënten, zorgverleners en assistenten. Ook uit deze studie komt een model dat beschrijft hoe supervisor afwegen of ze falen toe te staan, waaronder het vaststellen van een oriëntatie, het analyseren van factoren die van invloed zijn op de besluitvorming en leergesprekken met specialisten in opleiding. Het heeft daarmee bijgedragen aan een beter begrip van het fenomeen. In deze studie waarschuwden de supervisoren kinderartsen in opleiding niet expliciet voor deze onderwijsstrategie, en ze vermeden het gebruik van de term ‘falen’ tijdens de leergesprekken om hen te beschermen tegen de mogelijke psychologische schade die met die term samenhangt.

Hoofdstuk 6 verschuift de focus naar de percepties en ervaringen van specialisten in opleiding met het toestaan van falen in klinische opleidingsituaties, waarbij hun bewustzijn van het fenomeen, alsmede hun gevoel van de emotionele en educatieve waarde van falen werden onderzocht. Deze constructive grounded theory-studie toonde dat specialisten in opleiding weten dat hun supervisoren hen soms toestaan te falen. Ze zien dit falen als potentieel nuttig om te leren, maar of dat potentieel gerealiseerd werd was afhankelijk van de manier waarop het falen en de (afwezigheid van) nazorg hierover verliepen. Vaak vond er geen expliciete dialoog met supervisoren plaats over het falen en de gevolgen of effecten daarvan, waardoor het weinig of negatief effect had op het functioneren en leren. Wanneer specialisten in opleiding door hadden dat supervisoren hen lieten falen, werd hun beoordeling van de gebeurtenis mede beïnvloed door de (gepercipieerde) intentie van de supervisor. De betekenisgeving aan de hand van deze afwegingen bepaalde of de specialist in opleiding de ervaring van gesuperviseerd falen als constructief of destructief ervaarde.

Terugkomend op het idee van niet-lineariteit, bespreekt **hoofdstuk 7** het "butterfly effect" binnen het complexe, dynamische, sociale fenomeen van klinische supervisie. Het benadrukt het belang van erkennen dat interacties tussen supervisoren, specialisten in opleiding en patiënten inherent niet-lineair zijn, waarbij het de conventionele aannames in medisch onderwijs uitdaagt. Ik betoog dat onderzoekers die worstelen met deze complexiteit hun conceptueel kader moeten verbreden om niet-lineariteit te includeren. Alleen met een verruimd perspectief kunnen we superviserende interacties verkennen die geen expliciete, zichtbare of hoorbare aanwijzingen hebben: de ogenschijnlijk onzichtbare verstoringen in de dynamiek van het superviseren. Door deze verstoringen te erkennen en er begrippen en taal voor te ontwikkelen, kunnen onderzoekers inzicht krijgen in hoe niet-lineariteit van invloed is op het leren van specialisten in opleiding en de veiligheid van patiënten. Dit hoofdstuk stelt dat, hoewel niet-lineariteit verontrustend kan zijn voor onderzoekers, het belangrijk is om toe te voegen aan lineaire aannames bij het beschrijven van dynamische fenomenen zoals klinische supervisie en en het toestaan van falen.

Hoofdstuk 8 vat de bevindingen samen van de verschillende studies in dit proefschrift, verduidelijkt hun verband met relevante literatuur uit verschillende domeinen en presenteert verschillende mogelijkheden voor toekomstig onderzoek. Ik reflecteer tevens op de belangrijkste uitdagingen die tijdens het onderzoek zijn ondervonden, met name in het licht van de gevoeligheid van het onderwerp en de impact van taalgebruik. Daarnaast bespreek ik zowel de potentiële beperkingen als de kracht van dit proefschrift. Tot slot bied ik, met behulp van

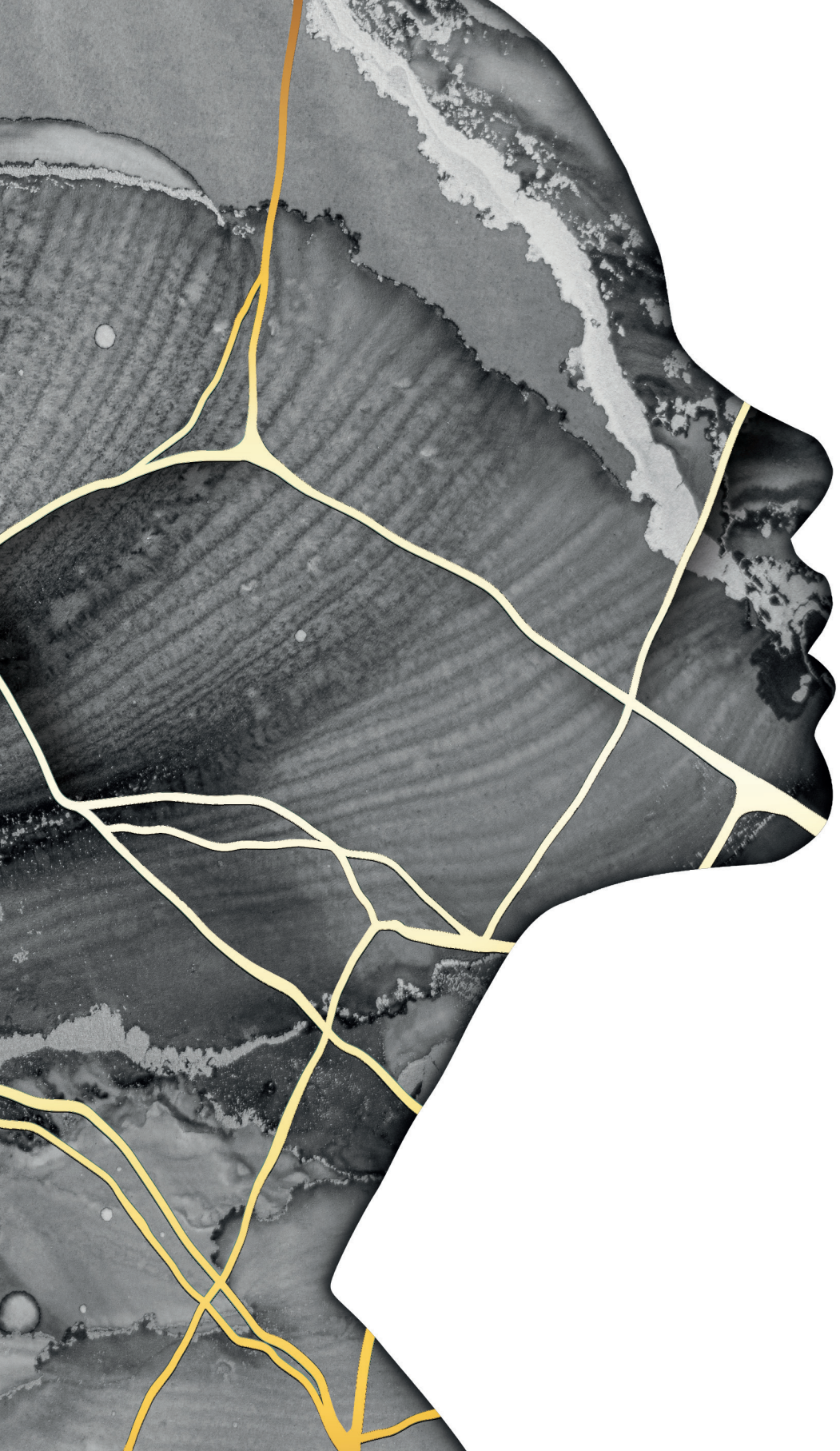
verschillende methoden voor gegevensverzameling en het onderzoeken van verschillende contextuele factoren, meerdere aanbevelingen voor toekomstige verkenningen die gericht zijn op het onderzoeken van het fenomeen van het toestaan van falen vanuit diverse epistemologische perspectieven.



Curriculum vitae

Curriculum vitae

Jennifer Margaretha Klasen was born on August 16, 1983, in Völklingen, Germany. She obtained her medical degree from the University of Leipzig in 2009. After graduation, she began her surgical residency training at Spital Bülach in Switzerland. From 2011 until 2014, she trained in the Department of Abdominal and Transplant Surgery at the Inselspital Bern. PD Dr. Klasen completed her residency training in 2014 before she was promoted to the position of junior consultant at the Kantonsspital Frauenfeld, Spital Thurgau AG, Switzerland. Early in her residency, she discovered her passion for clinical teaching. Thus, PD Dr. Klasen enrolled in the Master of Medical Education program at the University of Bern, Switzerland, in 2016, which she completed in 2018 after submitting her master's thesis. In 2018, PD Dr. Klasen enrolled in the PhD program at the School of Health Professions Education (SHE) at Maastricht University. She joined the Centre for Education Research & Innovation, Schulich School of Medicine and Dentistry, Western University, London, Ontario, Canada, for a Medical Education Research Fellowship in 2019. Afterwards, PD Dr. Klasen begun to work at Clarunis, the University Digestive Health Care Center Basel, as a consultant and faculty member at the University Hospital Basel in Switzerland. Her research is driven by her desire to learn and understand how communities of clinicians, educators and scientists can work towards providing excellent educational outcomes for trainees while improving healthcare for patients. In this context, PD Dr. Klasen is personally, professionally, and organizationally intrigued by learning from failure. She hopes to improve the current scholarly understanding of learning from failure and move the field toward a growth mindset in which failure is seen as a way of learning that does not involve blame and shame. To date, she has won several teaching and research awards. In addition, she has authored 45 peer-reviewed manuscripts, 24 as first author and five as senior author.



Acknowledgements

Acknowledgements

Where you're going isn't the only thing that matters; it matters who you have beside you. Therefore, I extend my heartfelt gratitude to the remarkable individuals who have played vital roles in the completion of my Ph.D. journey.

To my esteemed supervisors, Lorelei, Pim and Erik, I am deeply thankful for your guidance, wisdom, and unwavering support. Your collective expertise has been a beacon that has guided me through the intricate realms of medical education research and academia. I appreciate the time and effort you dedicated to providing me with valuable feedback, sharing your expertise, and fostering an environment of intellectual curiosity. You all form part of my supervisory dream team!

Pim: Your wisdom and elaborate insights have been a shining light throughout this journey. Your mentorship and the combination of your educational and clinical brilliancy have not only enriched the academic aspects of this project but also significantly shaped my understanding of our explored phenomenon. Your ability to offer nuanced perspectives and thoughtful guidance has been instrumental in my navigation into the complexities of the research process.

Erik: Your refreshing and unique perspective has challenged and enriched my understanding of the subject matter. In addition, your caring approach fostered a supportive and nurturing environment that made the research journey not only intellectually stimulating but also personally rewarding. Your genuine concern for the well-being of both the project and those involved has made me feel comfortable and seen. It is one of the best feelings Ph.D. candidates can wish for.

Lorelei: Words cannot describe my appreciation for the time we spent on this journey together. Your energy and commitment have allowed me to grow both personally and professionally. Your mentoring beyond this thesis is invaluable for me as a person, an academic surgeon, and a researcher. From the bottom of my heart, thank you for being a generous travel companion, a beloved friend, and the best godmother for my daughter I could have ever imagined.

Thanks go out to the team of the Centre for Education Research & Innovation (CERI) at the Western University, London Ontario, Canada. Your collaborative spirit and shared commitment to excellence have contributed to the success of my endeavours in medical education. You showed me how to ask questions that matter and to give answers that impact.

A special acknowledgement goes to the current and past CERI ladies—Taryn, Sarah, Kori, Erin, Jacqueline and Rachel. You have been a source of inspiration and camaraderie during my research time in Canada and beyond. Your shared dedication to our common goals has enriched my academic experience.

Thank you to my dear colleague and collaborator, Dr. Jimmy Beck. Working with you was an absolute pleasure and joy; your dedication to our project inspired me in every meeting! I sincerely hope to collaborate with you again in the near future.

To the research participants from the presented studies, thank you for courageously sharing your experiences with me and, ultimately, our community. Your contributions to this research program, to medical education and to our society were invaluable, and it is ultimately because of you that the conversation about failure in medical education has been advanced.

I express my gratitude to my mentors throughout my surgical career, particularly Dr. Brigitte Muff and Prof. Dr. Markus Müller. Both of you recommended that I pursue an academic career and believed in me. Your motivation and encouragement have been pivotal in shaping my academic aspirations and fuelling my commitment to my career. I also thank my other mentors and supervisors during this part of my career.

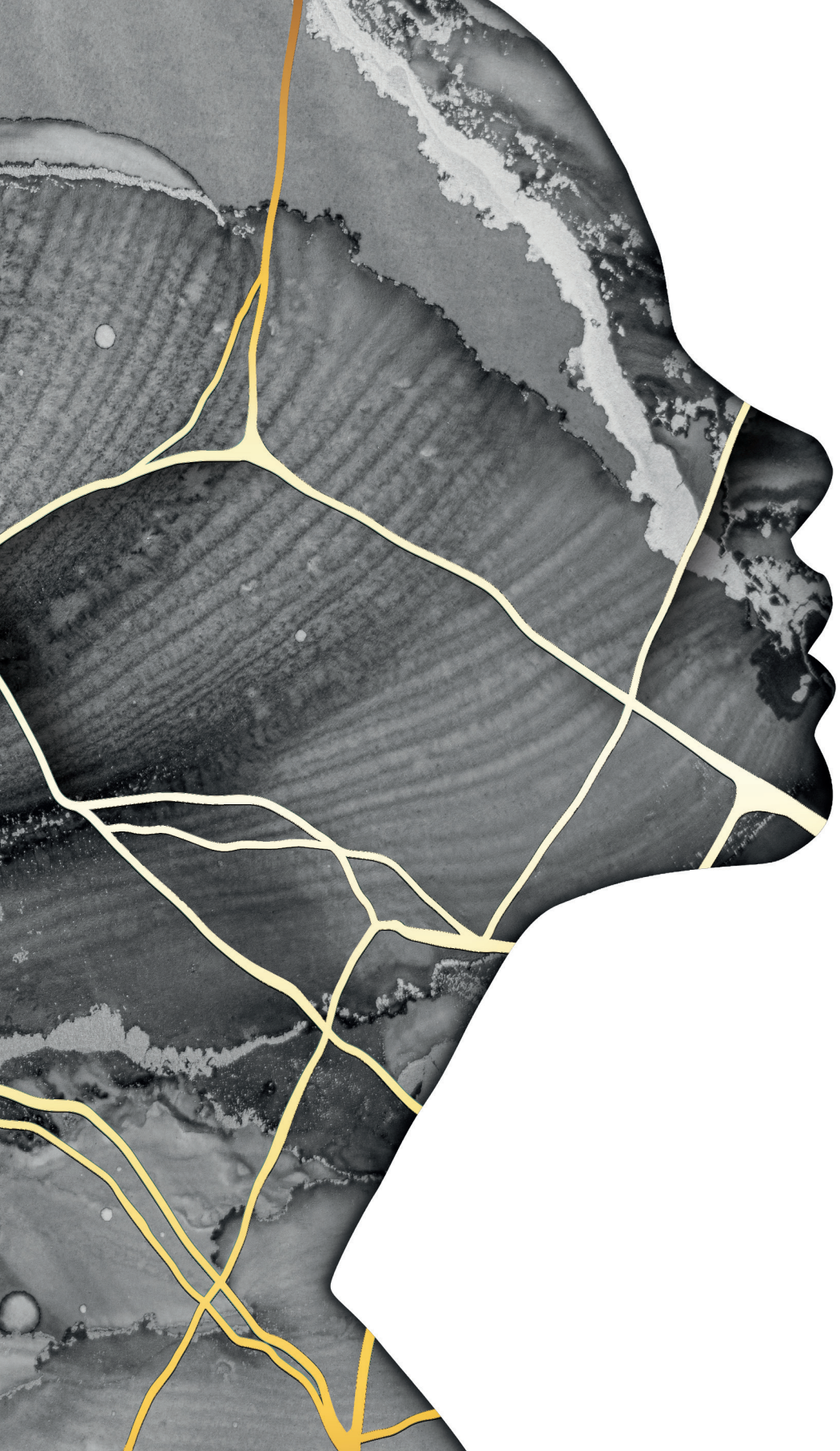
I extend my heartfelt gratitude to the residents and medical students, including my master and doctoral thesis students, whom I've had the immense privilege of teaching and supervising—individuals from whom I have gleaned invaluable insights. You have enriched my experiences conducting this research, and you continue to inspire me every day.

To my dear friends, Myriam, and Giovanna: Your unwavering belief in me, your pride in my achievements and your constant presence have been invaluable. You made me feel important. I am grateful for your genuine support, which has made this journey more meaningful. Thank you for giving me the honor to be the godmother of your children.

I extend my deepest gratitude to my parents. Together, you have formed a tapestry of support, encouragement and inspiration that has propelled me forward. Mama, thank you for continuing to serve as a role model who exemplifies empathy, service and emotional connection. Papa, my ambition and dedication to hard work come from you, so thank you. To my brother, Tim: Thank you for being you. You can say a lot even with a few words. Thank you for trusting me to be the godmother of my wonderful nephew and for being an aunt to my gorgeous niece. I love the bond our families share.

Ole, your steadfast support has been the rock upon which I have built my personal, professional, and academic endeavours. Having a surgeon and academic researcher by your side must be nerve-wracking. Your encouragement and unwavering belief in my capabilities have been a source of strength throughout this challenging journey. You have been my beloved travel companion over the past 12 years, and we have experienced several adventures together. Seeing you grow as a man, a leader and a dad parenting our gorgeous daughter fills me with pure love and peace. I love you more than you can imagine. Being by your side made this achievement possible.

Frieda, being your "Mama" brings me so much joy and is an unparalleled honour. Your presence has brought immeasurable inspiration and purpose to my life. Your boundless love has fuelled my determination to pursue excellence not only to impress the future you but also to show you that you can make a difference in this world. You have indelibly changed my life, and your significance to me and your dad is immense. Your love and your sweet soul have not only been my sources of strength, but also constant reminders of the impact one person can have on another. I am deeply grateful for the profound influence you've had on my journey, and I cherish the unique and irreplaceable role you play in my life.



SHE dissertations series

SHE dissertations series

The SHE Dissertation Series publishes dissertations of PhD candidates from the School of Health Professions Education (SHE) who defended their PhD theses at Maastricht University. The most recent ones are listed below. For more information go to: https://she.mumc.maastrichtuniversity.nl

Loosveld, L. (07-12-2023) Finding the merit of mentoring Mentors' personal knowledge and beliefs about mentoring in health professions education

Puranitee, P. (02-11-2023) Alleviating burnout in medical school: increasing a sense of belonging and collegiality in the clinical workplace

Nobel, M. (28-09-2023) The radiological report: a compromise between structured reporting and natural language processing

Heijnens, L. (16-06-2023) Aspects of geometry, fixation and materials in total hip arthroplasty. What have we learned?

Gillespie, H. (06-06-2023) Helping students become doctors: analysing tensions and releasing opportunities in clinical workplaces

Khan, M. (16-05-2023) Overcoming barriers in the prevention of surgical site infections: a master plan employing task-based interprofessional training

Tremblay, M-L. (08-05-2023) Lights. Camera. Action. Debrief. Designing Immersive Simulation for Novices to Promote Learning

Bynum, W. (15-02-2023) Out of the Shadows: A qualitative exploration of shame in learners across the continuum of medical education

Mordang, S. (07-02-2023) Challenges in high-value cost-conscious care training of residents: Exploring the various stakeholders' roles and attitudes

Brouwer, E. (12-12-2022) Medical education without borders. The what, why and how of International Medical Programmes

Kellar, J. (26-10-2022) Becoming Pharmacists: Professional identity struggles of a profession in transition

Biwer, F. (08-07-2022) Supporting Students to Study Smart – a learning sciences perspective

Bransen, D. (22-06-2022) Beyond the self: A network perspective on regulation of workplace learning

Lee, J. (08-06-2022) The Medical Pause in Simulation Training

Kruepunga, N. (17-05-2022) Development of the caudal part of the human embryo

Cantillon, P. (28-04-2022) The Social construction of clinical education: being and becoming in clinical teams

Pieters, J. (01-04-2022) Let's talk about it:Palliative care education in undergraduate medical curricula

Jonge de, L. (28-03-2022) Is it all in the mind? Stakeholder conceptions on workplace based assessment

Beuken, J. (25-3-2022) Waves towards harmony: Learning to collaborate in healthcare across borders

Ilgen, J. (15-12-2021) Comfort with uncertainty in medical professionals. An exploration of how clinicians experience and manage dynamic problems in practice

Schut, S. (9-12-2021) The Burden of Proof - Agency and Accountability in Programmatic Assessment'

Hui, L. (6-12-2021) 'Fostering Self-Regulated Learning: the Role of Perceived Mental Effort'

Meeuwissen, S. (12-11-2021) 'Team learning at work. Getting the best out of interdisciplinary teacher teams and leaders'

Nguyen Thi, V.A. (02-11-2021) Motivating and educating health professionals to work in less attractive specialties: Findings from experiences of Vietnam

Martens, S. (15-10-2021) Building student-staff partnerships in higher education

Lestari, E. (05-10-2021) INTERPROFESSIONAL EDUCATION Lessons from Indonesia

Atherley, A. (27-09-2021) Beyond the struggles: Using social-developmental lenses on the transition to clinical training

Schillings, M. (06-07-2021) Talking about feedback: Face-to-face peer dialogue about written feedback

Wilbur, K. (05-07-2021) NO WHERE | NOW HERE: Context and Competency Expectations in Workplace-Based Training

Bendermacher, G. (02-07-2021) Navigating from Quality Management to Quality Culture

Ahmed Khan, R. (29-06-2021) Assessing curriculum viability in Undergraduate Medical Education

Chim, H.Q. (30-03-2021) Physical Activity Behavior and Learning in Higher Education

Dominguez, L.C. (23-02-2021) Persistence in surgical training: The role of job crafting and leadership

Bindels, E. (22-02-2021) DOING WELL, GETTING BETTER; Facilitating physicians' reflection on their professional performance

Iqbal, Z. (15-12-2020) All stakeholders matter in faculty development: Designing entrustable professional activities for small group facilitation

Tran, QT. (09-12-2020) Nationwide implementation of medical skills training laboratories in a developing country: studies from Vietnam

Pacifico, J. (30-11-2020) Making the Implicit Explicit: Uncovering the Role of the Conceptions of Teaching and Learning and the Perceptions of the Learning Climate in Postgraduate Medical Training.

Nishigori, H. (17-11-2020) Why do doctors work for patients? Medical professionalism in the era of neoliberalism

Oudkerk Pool, A. (06-11-2020) Competency-based portfolio assessment – Unraveling stakeholder perspectives and assessment practices

Geel van, K. (05-11-2020) Lifelong learning in radiology: all eyes on visual expertise

Stammen, L. (16-10-2020) Pursuing - High-Value, Cost-Conscious Care - The Role of Medical Education

Meulen van der, M. (15-10-2020) Assessment of physicians' professional performance using questionnaire-based tools

Matsuyama, Y. (05-10-2020) Contextual attributes fostering self-regulated learning in a teacher-centered culture: learner's professional identity formation is a trigger

Rovers, S. (16-09-2020) Growing knowledge, supporting students' self-regulation in problem-based learning

Bourgeois-Law, G. (03-09-2020) Conceptualizations of remediation for practicing physicians

Giuliani, M. (19-05-2020) A Critical Review of Global Curriculum Development, Content and Implementation in Oncology

Schreurs, S. (20-03-2020) Selection for medical school; the quest for validity

Schumacher, D. (19-03-2020) Resident Sensitive Quality Measures: Defining the Future of Patient-Focused Assessment

Sehlbach, C. (21-02-2020) To be continued…. Supporting physicians' lifelong learning

Kintsugi, a traditional Japanese art form, involves repairing broken ceramics using lacquer coated with gold. Instead of hiding the cracks, this technique highlights them with golden seams, transforming the damaged artifacts and appreciating them as a valued part of their individual history.

The same should be valid for failure.