International Journal of
Environmental Research and Public Health

MDPI

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A Literature Study of Medical Simulations for Non-Technical Skills Training in Emergency Medicine: Twenty Years of Progress, an Integrated Research Framework, and Future Research Avenues

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Abstract: Medical simulations have led to extensive developments in emergency medicine. Apart from the growing number of applications and research efforts in patient safety, few studies have focused on modalities, research methods, and professions via a synthesis of simulation studies with a focus on non-technical skills training. Intersections between medical simulation, non-technical skills training, and emergency medicine merit a synthesis of progress over the first two decades of the 21st century. Drawing on research from the Web of Science Core Collection's Science Citation Index Expanded and Social Science Citation Index editions, results showed that medical simulations were found to be effective, practical, and highly motivating. More importantly, simulation-based education should be a teaching approach, and many simulations are utilised to substitute high-risk, rare, and complex circumstances in technical or situational simulations. (1) Publications were grouped by specific categories of non-technical skills, teamwork, communication, diagnosis, resuscitation, airway management, anaesthesia, simulation, and medical education. (2) Although mixed-method and quantitative approaches were prominent during the time period, further exploration of qualitative data would greatly contribute to the interpretation of experience. (3) High-fidelity dummy was the most suitable instrument, but the tendency of simulators without explicitly stating the vendor selection calls for a standardised training process. The literature study concludes with a ring model as the integrated framework of presently known best practices and a broad range of underexplored research areas to be investigated in detail.

Keywords: emergency medicine; communication; leadership; crew resource management; high-fidelity simulation training

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Citation: Zhang, C. A Literature Study of Medical Simulations for Non-Technical Skills Training in Emergency Medicine: Twenty Years of Progress, an Integrated Research Framework, and Future Research Avenues. *Int. J. Environ. Res. Public Health* **2023**, *20*, 4487. https://doi.org/10.3390/ijerph20054487

Academic Editor: Kristina Keitel

Received: 9 December 2022
Revised: 26 February 2023
Accepted: 1 March 2023
Published: 2 March 2023

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1. Introduction

Recent advances in the application of non-technical skills in emergency medicine have led to a growing interest in the use of medical simulations. The integration of medical simulations is an important step in the curriculum development process [1]. Although previous studies have examined simulation modelling in nearly all healthcare systems [2], few studies have adapted the definition of simulation to a fast-paced, team-oriented speciality. This article defines medical simulation in emergency medicine as the educational modality to provide participants with hands-on experiences in the diagnosis and treatment of acute illnesses such as trauma and injuries. Thus far, the area of application has almost entirely focused on eliminating disparities between theory and clinical practice. Realistic medical education uses a wide range of teaching techniques, such as dummies [3], mannequins [4], organs, film and television teaching materials [5,6], simulation cases [7], real patients or simulated patients [8], and so on. Although patient scenarios and conditions could be revised based on the instructor's choices, a realistic situation of doctors and nurses requires a methodical approach. Utilizing a variety of subspecialties, high-level digital simulation

dummies, clinical teaching plans for emergency and severe cases, teamwork training, and scene extension training of various team composite situations allows for the most authentic representation of doctors and nurses in challenging medical settings, improving trainees' clinical treatment abilities.

Non-technical skills affect quality and safety in emergency medicine. On one hand, frequent adverse events occur often during health monitoring, triage, patient hand-off, and emergency management, indicating a lack of cognitive, social, and personal capacities. Non-technical skills training, on the other hand, is often understudied in comparison to technical skills training, and training outcomes vary between simulation studies. Furthermore, the management of quality and safety care requires certain skill sets such as communication [9], cooperation [10], leadership [11], decision-making [12], coordination [13], collaboration [14], and others [15,16]. These considerations call for more realistic scenarios than those hitherto employed in medical education. In addition, the use of scientific evidence and statistical methods can support formal assessments and evaluations. While the use of information technology is on the rise, there are opportunities and challenges for cutting-edge user interface design.

The majority of professions specialising in emergency medicine could be actively involved in centre-based simulations with larger facilities or pilot test activities taking place on the premises. Whilst the Tea Bag Model was applied in the early days [17], medical students were required to join a specialist department, spend around three to five years of study, and pass a specialist examination before becoming an attending physician. Later, the concept of competency-based medical education was proposed by the World Health Organization to pinpoint the intended output as a health professional who can practise medicine at a defined level of proficiency [18]. The tendency towards a competency-based approach, which serves as the foundation for a new accreditation model [19], has attained popularity in medical education. Recently, research has given rise to the confirmation of experiential learning theory [20] and flipped learning styles [21,22]. Nevertheless, there has been little discussion about the opportunities that medical simulation provides for non-technical skills training in emergency medicine, as to which non-technical skills can be trained, what types of simulators are available, and which analytical methods are required to process data collected from the operational clinical environment.

Most research on non-technical skills has focused on patient outcomes and how reactions from participants, often through questionnaires, contribute to the effectiveness and usefulness of the instrument [23,24]. There is no overview of training experience design that accounts for the collection of behavioural data and the achievement of intended training goals from the instructor's perspective. This is arguably due to the research scope of application-oriented studies being mostly constrained to the relationship between professional roles, parameters of the medical simulation category, and details of the investigated patient scenarios. Previous literature studies focused on a single type of medical simulation, publications from a short time period, single research methods, and studies that did not provide comprehensive coverage of non-technical skills, not to mention the level of the operational clinical environment and medical simulation vendors endorsing top-notch research in this field.

This study is a continuation of the work by Zhang et al. [25], with an emphasis on identifying available forms of medical simulation as means for training non-technical skills in emergency medicine. These skills do not require an outstanding technical background; rather, their acquisition and application represent one of the greatest challenges encountered by medical education nowadays. It is, therefore, worthwhile to distil from a comprehensive list of publications the medical simulation categories, involved professions, research methods, specific areas of non-technical skills, behavioural data sources, operational clinical environment, and vendor. The underlying relationships between educational morality, participants, and the instructor are thoroughly examined, resulting in an integrated framework which can be used as a blueprint for other simulation projects. Based

on these findings, the objective of this paper is to provide a literature study to answer the following research question:

- What lessons have been learnt over the past two decades from utilizing medical simulations for non-technical skills training in emergency medicine?

2. Research Method

The electronic data search draws on the Science Citation Index Expanded (SCI) and Social Sciences Citation Index (SSCI) editions of the Web of Science Core Collection. These editions are the most prominent academic volumes where articles are originally published in significant and high-quality scientific journals. A combined search of the terms "interprofessional," "leadership," "teamwork," "team-work," "communication," "decision-making," "coordination," "management," and "non-technical skills" is performed in conjunction with "medical simulation" and "emergency medicine". "Topic" as a field tag is introduced to the query to narrow down the focus of the literature by recognising matches only within the title, abstract, and keyword sections. All searches are restricted to journal articles with peer review.

Articles are examined to shortlist relevant literature according to the inclusion criteria. The research should strive to improve non-technical skills or promote the efficiency of non-technical skills training for emergency medicine personnel. Furthermore, participants must have the same level of experience in medical simulations. Abstracts, conference proceedings, posters, book reviews, and entries without access to the full texts were discarded. In addition to these criteria, the paper must fall into any of the following categories:

- Application paper. The study incorporates at least one medical simulation category and implements a simulation-based experiment to illustrate facets of emergency medicine.
- Methodological contribution. The study precedes a simulation of any medical system; rather, it offers either a methodological critique or an evaluation of relevant simulation experiments.
- Literature review. The study synthesises the significant aspects and outcomes from a vast number of references in the investigated area of research.

CiteSpace, an information visualisation tool for bibliometric analysis [26], is used to attribute publications by referencing networks. This presentation lines up scholarly patterns in scientific literature. The advancement of research avenues can be represented by sociogram-like clusters. These clusters consisted of nodes and link lines, respectively, denoting article data and co-occurrence relationships. The visualisation parameters are configured to prioritise significant referencing networks with the clearest labels: time slicing (from 2001 to 2020, years per slice = 1), node type (one selection at a time from keyword and institution), and pruning (none).

3. Results

Based on the SCI and SSCI literature, 298 out of 887 papers fulfil the inclusion criteria. Table 1 presents the categorization of 215 application papers, 50 methodological contributions, and 33 literature reviews, and published between 2001 and 2020. Of the entire selection, 161 records account for communication, 101 for teamwork, 68 for leadership, 47 for decision-making, 21 for coordination or collaboration, and 50 for other specific categories.

3.1. Medical Simulations for Non-Technical Skills Training in Emergency Medicine: Overview

In recent years, high-fidelity simulation has emerged as the most frequently deployed medical education instrument for enhancing the development of non-technical skills in emergency medicine. Their human–computer interaction interfaces bring together medical practitioners with convenience and fidelity. Among relevant publications, 69 records account for communication, 48 for teamwork, and 29 for leadership. The number of papers adopting mixed-method approaches and utilising observations outnumbers those

employing other research methods and data types, respectively. Most simulations were implemented at the unit level with Laerdal's SimMan products as the most relied-upon items. Schulte-Uentrop et al. presented a correlation between motivation and non-technical skill performance based on Resusci Anne from Laerdal Medical [15], confirming the suitability of the medical simulation used for training a wide range of resuscitation skills. Su et al. deployed the SimMan 3G simulator from Laerdal to strengthen communication in advanced cardiac life support [27]. Through applying an effective communication strategy, the authors demonstrated the positive effects of high-fidelity simulation on self-efficacy and knowledge transfer. Depending on the adequacy of the solution, the instructors could resemble high-fidelity environments via the process of integrating human–patient simulations [28], mannequins [29], or simulation suites [30] to work with one another.

Human–patient simulations, which model virtual appearances and behaviours of high relevance for the context of the planned simulation activity, are promising interactive learning systems across specialities, particularly emergency medicine. Full-responsive models with realistic characteristics could display neurological, physiological, or physical symptoms. Implementing computerised or pre-programmed scenarios would engage training participants in communication and teamwork. Among publications, 39 records account for communication, 25 for teamwork, and 21 for leadership. Observations and mixed-method approaches were used in most articles. The majority of simulations were carried out at the unit level with Laerdal's SimMan product as the most popular item among the wide range of wares. To disseminate innovations in medical education, a central venous catheter simulator has been successfully adopted to incorporate the expertise of internal and emergency medicine residents in different medical education settings [31]. This study underlined the active role of educational leadership in the administration of medical simulation programmes. Armbruster et al. showcased 25 exemplary missions carried out by emergency doctors in a training programme driven by NASimSaar25 [32], a patient simulator well evaluated by the majority of the target group. Simulation training prepared participants for rare emergencies and invasive measures. Stone et al. proposed a standardised setup consisting of SimBaby from Laerdal and the resuscitation room of the emergency department [33]. The curriculum format was considered the best arrangement for resuscitation education on the virtue of leadership and communication.

Mannequin-based simulation is based on instrumented human models that differ in major areas of styles, personalities, and aspirations. The physiological motivation provided by a whole-body component in conjunction with a variety of accessories allows for in-depth training of a wide range of non-technical skills. Among publications, 28 records account for communication, 14 for teamwork, and 13 for leadership. The numbers of articles using observations, mixed-method approaches, and unit-level settings outweigh all other categories by a large margin. SimMan and Resusci Anne from Laerdal were the prevalent simulation products. Dadiz et al. deployed Noelle and HAL from Gaumard Scientific as mother and infant mannequins in a simulation-based, interdisciplinary training programme [9]. Results showed that providers' communication in the delivery room and with families improved over time. Dermody et al. utilised a Fiberoptic Evaluation Station, including task trainers, to develop an intensive simulation-based course [34]. More than 85% of the participants confirmed the usefulness of the intervention in helping them possess appropriate knowledge and increase their self-confidence. Simulated Emergency Medical Service missions were launched using Ambu Mini MegaCode from Ambu A/S Ballerup, according to Zimmer et al.'s study [35]. Through video-based observations, the authors successfully identified unwarranted behaviours that would jeopardise patient safety, a process in which mannequins may serve as overall facilitators with a focus on the quality of communication during actual deliveries of medical care.

In situ simulations can be useful to uncover active errors and identify salient aspects of the environment at the place of occurrence. Participants are repeatedly exposed to contextual data via hands-on workshops, which provide more information for understanding the relationship between individual practice and the larger medical system. Twenty-three

records account for communication, 21 for teamwork, and six for leadership. It is worthwhile to note the prevalence of quantitative methods. Additionally, there is an equal number of studies performing simulations at the unit and department levels. Laerdal's SimMan products, however, remain the top choice. West et al. conducted interprofessional simulation activities using a disaster-day instrument [36]. The findings revealed higher students' self-ratings on average than those of the standardised patients. Couto et al. compared teamwork in emergency departments using video-based assessments [37]. On the basis of survey results, in situ simulation was considered more realistic and effective. To facilitate consistent safety measures during airborne rescue missions, Lischke et al. used MedSim to exercise communication, decision-making, and situational awareness [38]. Their pilot project introduced rich contextual information to the overview of the emergency scenario using terrain and helicopter wagons inside a mountain rescue training centre.

Screen-based simulations in emergency medicine are increasingly being recognised as multimedia systems with human–computer interfaces. It has the potential for human–computer interfaces to curate graphical features, texts, and animations referring to illnesses or injuries as needing immediate medical attention. They have demonstrated outstanding efficacy by virtue of their built-in analytical tools, particularly computing systems, to understand the behavioural patterns of participants in a simulated environment, which is valuable information for the activation of design features that are relevant to the training experience. Among publications, five records account for communication, three for leadership, and two for decision-making. There is a greater number of articles using mixed-method approaches. However, outcomes as a data source and simulations at the unit level attract the fewest applications. Gerard et al.'s simulation received favourable reviews for involvement, realism, and instructional value [39]. Results showed practical evidence for serious game scores to formally assess knowledge and skills in emergency medicine. Through online commercial games, Greci et al. recreated a community-based hospital and its surrounding neighbourhood for training skills in communication and decision-making processes during catastrophic events [40]. All participants reported positive experiences and learned more about disaster preparation. In order to practise teamwork in disaster management, Luigi Ingrassia et al. employed the Interactive Simulation Exercise for Emergencies Simulator to showcase the logistical aspects of emergency service planning [41]. This computer simulation proposed an innovative step in the efficient delivery of the disaster medicine curriculum.

Table 1. Classification of papers.

Research Focus	Reference	Non-Technical Skill	Stated Participant's Profession	Research Method	Data Collection Sources	Respective Operational Clinical Environment	Medical Simulation Product and Vendor
High-fidelity simulation	[10,12,15,23,27–30,34,42–115]	Communication (69); Teamwork (48); Leadership (29); Decision-making (19); Coordination/collaboration (12); Others (3)	Residents (26); Nurses (24); Physicians (17); Students (15); Doctors (6); Midwives (5); Therapists (5); Paramedics (4); Assistants (3); Gynaecologists (3); Surgeons (3); Anaesthesiologists (2); Pharmacists (2); Technicians (2); Trainees (2); Others (13)	Mixed-method (42); Quantitative (27); Qualitative (9); n/a (5)	Observational (45); Outcomes (24); n/a (20)	Unit (46); Department (17); Institution (16)	SimMan, Laerdal (10); SimMan 3G, Laerdal (5); METI, Medical Education Technologies (4); Resusci Anne, Laerdal (2); HAL, Gaumard Scientific (2); SimNewB, Laerdal (2); SimBaby, Laerdal (2); Noelle, Gaumard (2); SimJunior, Laerdal (1); PAEDSIM, Universitätsklinikum Tübingen (1); PediaSIM, CAE Healthcare (1); UltraSim, MedSim (1); PROMPT birthing simulator, Limbs and Things (1); Others (8)
Patient simulation	[10,11,16,31–33,60,62,67,68,84,85,87,95–97,105,107,110,112,114–152]	Communication (39); Teamwork (25); Leadership (21); Decision-making (12); Coordination/collaboration (5); Others (7)	Residents (16); Nurses (14); Physicians (14); Students (18); Midwives (1); Therapists (3); Paramedics (6); Gynaecologists (1); Surgeons (2); Anaesthesiologists (3); Pharmacists (1); Technicians (1); Trainees (1); Others (9)	Mixed-method (30); Quantitative (17); Qualitative (9); n/a (2)	Observational (35); Outcomes (17); n/a (13)	Unit (33); Department (11); Institution (11)	SimMan, Laerdal (20); SimMan 3G, Laerdal (7); METI, Medical Education Technologies (4); Resusci Anne, Laerdal (4); HAL, Gaumard Scientific (1); SimNewB, Laerdal (2); SimBaby, Laerdal (3); Noelle, Gaumard (1); Resusci Junior, Laerdal (1); CAE Healthcare (1); PROMPT birthing simulator, Limbs and Things (1); Atmosphere, Adobe Systems (2); ECS, Disastermed.Ca (1); CVC simulator, GT Simulators (1); Others (10)
Mannequin	[9,23,34,35,44–47,87,88,94,96–162]	Communication (28); Teamwork (14); Leadership (13); Decision-making (6); Coordination/collaboration (1); Others (2)	Residents (10); Nurses (12); Physicians (8); Students (7); Doctors (4); Midwives (2); Therapists (3); Paramedics (2); Gynaecologists (1); Surgeons (1); Anaesthesiologists (1); Pharmacists (1); Obstetricians (3); Interns (2); Others (8)	Mixed-method (28); Quantitative (2); Qualitative (6)	Observational (26); Outcomes (6); n/a (6)	Unit (20); Department (7); Institution (9)	SimMan, Laerdal (12); METI, Medical Education Technologies (1); Resusci Anne, Laerdal (4); HAL, Gaumard Scientific (1); Noelle, Gaumard (2); UltraSim, MedSim (1); PROMPT birthing simulator, Limbs and Things (2); Atmosphere, Adobe Systems (1); MegaCode, Ambu A/S Ballerup (1); Others (4)
In situ simulation	[36–38,46,65,66,81,88,103,104,106–109,111,145,151,163–173]	Communication (23); Teamwork (21); Leadership (6); Decision-making (5); Coordination/collaboration (3); Others (2)	Residents (9); Nurses (19); Physicians (12); Students (3); Doctors (1); Midwives (1); Therapists (6); Paramedics (1); Assistants (3); Gynaecologists (1); Surgeons (2); Anaesthesiologists (4); Pharmacists (4); Obstetricians (2); Technicians (3); Others (9)	Mixed-method (6); Quantitative (10); Qualitative (11); n/a (1)	Observational (19); Outcomes (9); n/a (5)	Unit (10); Department (10); Institution (5)	SimMan, Laerdal (3); SimMan 3G, Laerdal (3); Resusci Anne, Laerdal (1); HAL, Gaumard Scientific (3); SimBaby, Laerdal (1); Noelle, Gaumard (2); PAEDSIM, Universitätsklinikum Tübingen (1); PROMPT birthing simulator, Limbs and Things (1); ECS, Disastermed.Ca (1); SimCapture, B-line Medical (1); Others (3)
Screen-based simulation	[39–41,174–181]	Communication (5); Teamwork (1); Leadership (3); Decision-making (2); Coordination/collaboration (1); Others (4)	Residents (3); Nurses (3); Physicians (1); Students (5); Doctors (1); Surgeons (1); Anaesthesiologists (1)	Mixed-method (5); Quantitative (3); Qualitative (2); n/a (1)	Observational (5); Outcomes (2); n/a (5)	Unit (2); Department (4); Institution (3)	Second Life, Linden Research Inc. (1); iStan, Medical Education Technologies (1); ISEE Simulator, E-Semble (1); PediatricSim, Saint Louis University (1); First2Act, Monash University (1); SIMAN, Rockwell Software (1); ProModel, ProModel (1); AnyLogic, AnyLogic (1); Others (1);

Table 1. *Cont.*

Research Focus	Reference	Non-Technical Skill	Stated Participant's Profession	Research Method	Data Collection Sources	Respective Operational Clinical Environment	Medical Simulation Product and Vendor
Misc.	[182–194]	Communication (11); Teamwork (5); Leadership (3); Decision-making (3); Coordination/collaboration (1)	Residents (2); Nurses (4); Physicians (3); Students (3); Doctors (2); Midwives (1); Paramedics (1); Others (1)	Mixed-method (6); Quantitative (4); Qualitative (2); n/a (1)	Observational (8); Outcomes (2); n/a (4)	Unit (4); Department (6); Institution (3)	METI, Medical Education Technologies (1); ECS, Medical Education Technologies (1); Swiss medium fidelity simulator, Laerdal (1); iStan, Medical Education Technologies (1); PROMT flex model, Limbs and Things (1); ETS, Centre for Teaching and Research in Disaster Medicine and Traumatology (1); MACSIM, MACSIM (1);
Not specified	[24,195–234]	Communication (31); Teamwork (18); Leadership (12); Decision-making (12); Coordination/collaboration (2); Others (3)	Residents (4); Nurses (14); Physicians (8); Students (5); Doctors (10); Midwives (2); Therapists (1); Paramedics (7); Assistants (3); Surgeons (4); Anaesthesiologists (1); Technicians (1); Midwives (2); Others (9)	Mixed-method (13); Quantitative (14); Qualitative (12); n/a (4)	Observational (17); Outcomes (8); n/a (18)	Unit (19); Department (6); Institution (10)	EART simulation, Boston Medical Center (1)
Methodological contribution	[13,14,235–282]						
Literature review	[283–315]						

3.2. Communication

Communication plays an important role in developing therapeutic relationships between patients. The ability to build trust in the process of achieving common goals has become a highly sought-after non-technical skill in emergency medicine. It is often directly linked to the proficiency of both verbal and non-verbal responses. This management of challenging interactions between individuals is essential nowadays in the catchment area of emergency departments and medical workplaces. Joined by approximately 600 students at a U.S. dental school, McKenzie et al. studied the social determinants of health through simulation exercises on communication [45]. Results confirmed clinical performance improvement thanks to communication skills training with standardised patients and mannequins. Ayub et al. investigated the experience of prehospital providers in simulation settings [64]. The authors concluded that communication could overcome the environment- and manpower-related barriers, which have emerged as major themes in the delivery of patient- and family-centred care. Communication skill performance can be used to assess the educational effectiveness of medical simulators. To enhance acute care nurses' ability to identify and treat patient deterioration in a timely manner, Ozekcin et al. applied a non-technical skill framework in simulation exercises with debriefings [125]. Participants' responses showed a broadened knowledge base and decreased time span to critical actions once they adopted the situation, background, assessment, and recommendation strategies to recognise the instability of patients.

3.3. Teamwork

Teamwork skills in medical simulations are pursued in many innovative programmes to close performance gaps that impair practitioners' capacity. For teamwork training efforts to be successful, staff members must take part in the disclosure of urgent medical events and put forth a free flow of ideas across the emergency department. Teamwork could be exercised in simulation with overall improvements in team involvement, confidence, and objective understanding of the Emergency Airway Response Team, as suggested by Tsai et al.'s simulation project [210]. Knowledge assessment protocols might account for one's capacity to work in teams. Semler et al. analysed the effects of teamwork training with high-fidelity simulations, expert demonstrations of principles, and traditional didactics [73]. Expert-dependent, time-intensive simulation interventions offered positive effects on teamwork skills. Although individual skills improved as a result of simulations, according to Nelson et al. [217], the establishment of a positive atmosphere was not observed for the surgical wards. In addition to Nelson's suggestions for simulation-based training to raise awareness of safety issues, efficient teamwork was found to lower levels of patient harm in treatment [46]. Medical simulations combined with a structured teamwork curriculum could apply crew resource management principles to exemplify logistical considerations for acute stroke care.

3.4. Leadership

Leadership skills are increasingly recognised as strong determinants of peer relationships, workplace performance, and patient outcomes in emergency medicine. To promote a working environment steered by commitment, responsibility, and social order, leadership brings together personnel across disciplines to explore dynamic processes. In a simulation-based, randomised study, Weller et al. investigated information-sharing channels in an anaesthetic emergency [128]. The researchers discovered a link between information-probe sharing and callouts. A proactive team leader may expedite the development of a shared mental model among team members. Team debriefing immediately after resuscitation in simulation-based sessions contributed to declaiming leadership on-scene with the ambulance crew, as suggested by Clarke et al.'s study [213]. It was not just fulfilling a dedicated role for someone to stay with certain tasks; the resuscitation team leader rotated through the scenarios in Ten Eyck et al.'s study [12], suggesting that simulation training was critical to further developing strong leadership in comparison to the group discussion format. Lead-

ership can also be exercised in the interpretation of training outcomes from crew resource management courses—Parsons et al. incorporated medical simulations into a residency curriculum endorsed by SimMan 3G [60], showing evidence of effective simulation in the clear instruction of non-technical skills.

3.5. Decision-Making

Following the literature study, decision-making skills in emergency medicine provide practitioners with the capacity to react quickly and swiftly. The decision-making process in medical simulations emerges as a powerful problem-solving mechanism. In Morreel et al.'s study, the authors proposed a guideline for practitioners to determine patients' triage urgency level in tandem with their present medical condition [183]. The simulation study confirmed the steps required for handling a telephone triage supported by the correct protocol, urgency category, and resource management. In addition, results showed acceptable performance of the decision support system. In Gerard et al.'s serious game study, participants acted as healthcare providers, assessing and treating a wide range of acutely ill patients [39]. Game scores can serve as valid indicators for assessing decision-making skills. In a randomised crossover study, Krage et al. identified declining non-technical performance once external stressors distracted individuals from routine tasks [120]. Their simulation study analysed the effects of stressful conditions on decision-making performance and technical skills training outcomes after a cardiopulmonary resuscitation scenario. Nicksa et al.'s interprofessional simulation simultaneously developed technical and non-technical skills when dealing with high-risk situations [74]. The recreated scenarios were realistic and beneficial to the individual proficiency of surgical residents before handling such circumstances in reality. To summarise what has been stated so far, self-correction, monitoring, adherence to guidelines, and interactions between team members are critical to the decision-making process of high-stakes emergency scenarios in medical simulations.

3.6. Coordination and Collaboration

The interest in coordination and coordination corresponds to a greater awareness of patients under the system. This is based on a thorough understanding of cross-departmental and cross-institutional delivery systems. When handling tasks for patients, such non-technical skills are warranted to offer appropriate recommendations. Abu-Sultaneh et al. used in-person simulations to activate collaboration within the regional hospital system [104]. The overall adherence to the critical action checklist increased to over 70% thanks to the quality management partnership. In a high-fidelity simulation study, Schumutz et al. explored the coordination of algorithm-driven and knowledge-driven implementations of emergency tasks [108]. It should be noted that coordination affected performance. Luctkar-Flude et al. evaluated the communication and interprofessional coordination skills of nursing and medical students after going through an asthma exacerbation simulation [83]. The design of medical simulation studies to practise interprofessional coordination skills was consistent with earlier research evaluating comfort levels and confidence with procedures.

3.7. Others

Situational awareness, resource management, resource utilization, prioritisation, and time management were recognised as the less frequently trained non-technical skills in the medical simulation of emergency medicine. Here, situational awareness refers to the application of the personnel's sensory systems to approach the working environment, bearing in mind anticipated threats and prospective consequences. Resource management addresses all logistical aspects of patient hand-off and transport. In light of this, resource utilisation emphasises the ability to reserve capacity in the occurrence of unexpected events. Prioritisation accounts for patient inflow mapping in which the most critically ill patients are given priority. Time management gives staff members back control over patients since emergency medicine would require simultaneous and sequential interventions performed by different personnel.

3.8. Scholarly Pattern Analysis

The literature study shows that approximately 50% of simulation studies conducted during the early years of publication featured only one type of skill. To date, this accounts for the greatest proportion across medical simulation categories. In contrast, only in 2008 and 2015 did the number of simulation studies involving two types of skills outnumber those of all other categories. As the number of simulation studies involving more than two types of skills has increased recently, this trend has been applied throughout the graph, as shown in Figure 1. After reaching 33% in 2018, the percentage of research requiring more than three types of skills decreased, with the lowest gap between the categories occurring in 2019. In 2020, more scholarly attention was devoted to simulation studies of only one type of skill and two types of skills.

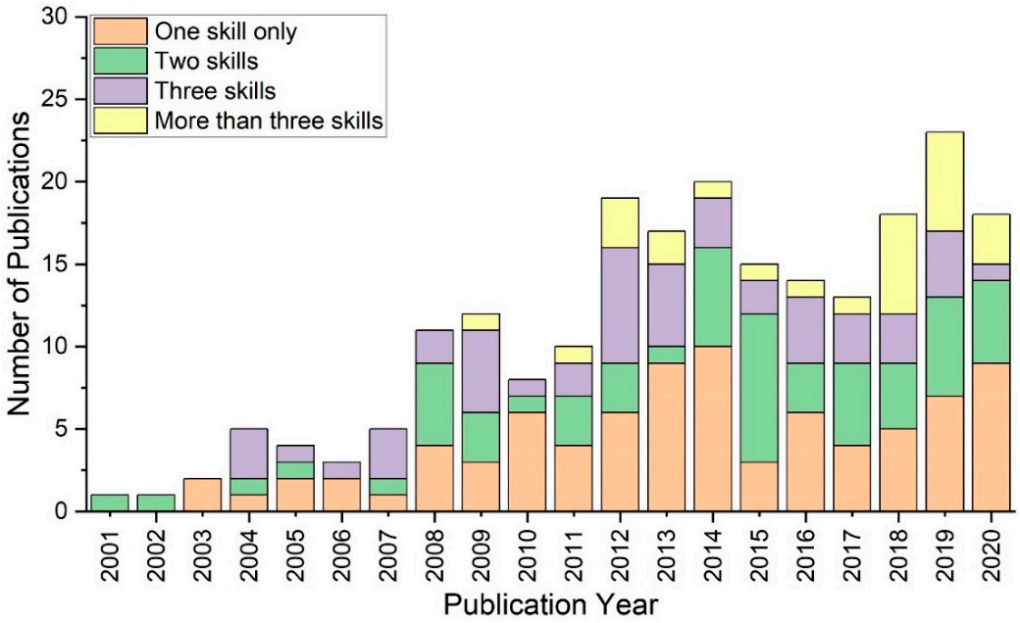


Figure 1. Number of non-technical skills in the literature between 2001 and 2020.

The bar chart indicates that simulation studies involving only one profession were distributed across the time period (Figure 2). While some researchers attested to the competency of two professions, others researched three or more. Overall, research involving only one profession had the largest number of publications, whereas there were few studies that did not explicitly state any profession. Those involving two professions and more than two professions had 59 and 76 publications, respectively. Notably, these categories have similar profiles. The frequency of publications involving only one profession grew substantially between 2001 and 2009. It fell somewhat between 2009 and 2010. Following that, the number of publications increased until it peaked at 12 in 2015. Its proportion, however, fell dramatically during the next five years.

Observations were the most common source of behavioural data during the time period, as shown in Figure 3. Between 2001 and 2010, the majority of research recognised video and verbal references among participants. In addition, built-in analysers have become more popular in screen-based and human–patient simulations. This was a promising source of behavioural data, whether quantitative or qualitative, as it provided a better understanding of the levels at which participants engaged the most. Simulation studies combining observational data and analysis procedures have contributed to a large proportion of publications between 2015 and 2020. However, in the last five years, studies that did not rely on any specific data sources have become more common. There is a need to take advantage of actionable intelligence in order to describe the psychological profiles of participants.

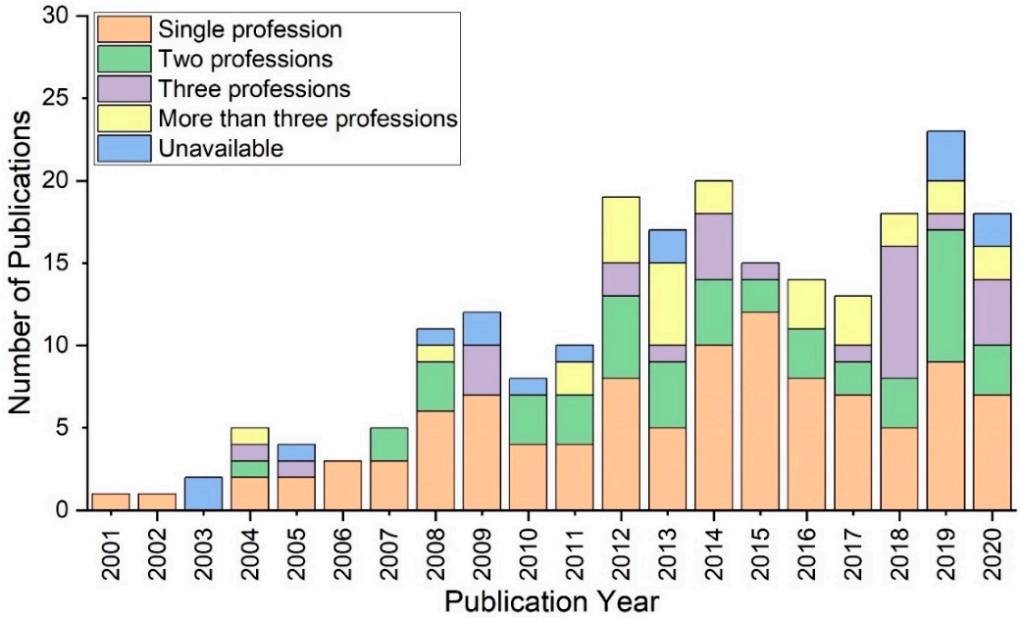


Figure 2. Number of studies involving professions between 2001 and 2020.

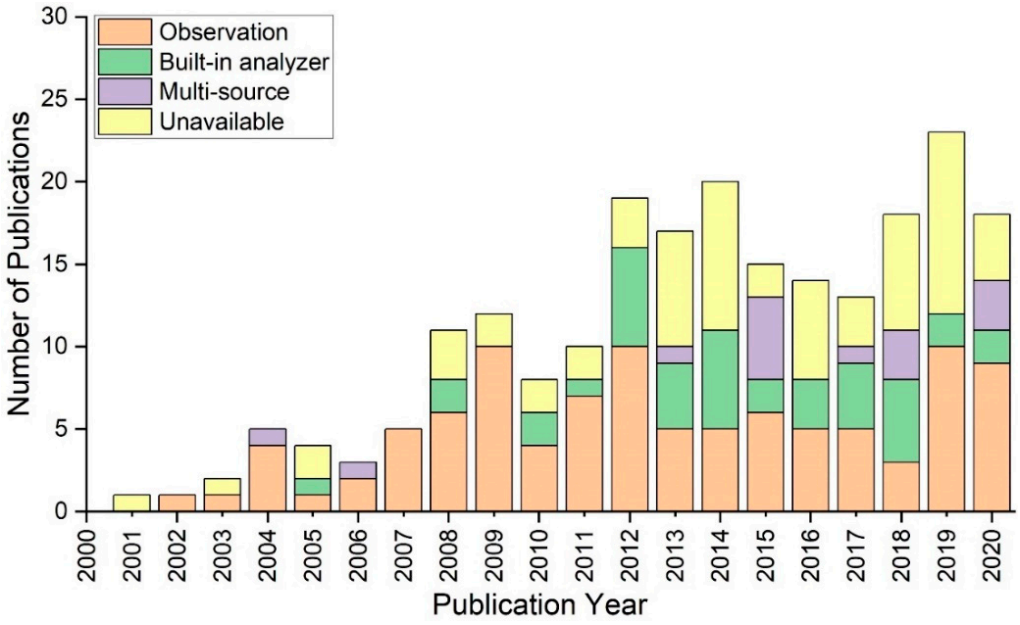


Figure 3. Number of studies interacting with behavioural data sources between 2001 and 2020.

As seen in Figure 4, the literature study identifies the operational clinical environment at the unit, department, and institution levels. The majority of research in this sector has been unit-wide, carefully monitoring the health status of patients. The data reveals that 2009 was the year with the highest number of unit-wide simulation studies, followed by a gradual increase in the number of publications addressing non-technical skill issues at the institutional level. Prior to 2011, there was department-wide training, with a steady growth in publications from 2017 to 2020. It is important to note that a number of studies have not explicitly stated the level of the operational clinical environment.

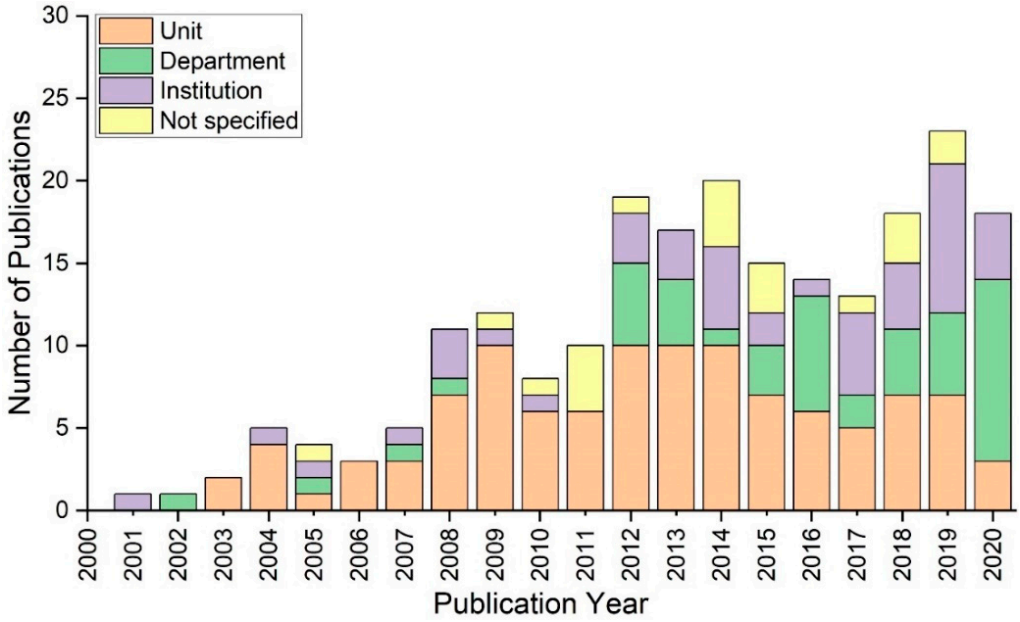


Figure 4. Number of studies carried out at the respective level of operational clinical environment between 2001 and 2020.

Figure 5 presents the number of papers employing quantitative, qualitative, or mixed-method approaches. More than half mixed-method studies were conducted before 2010. From 2011 through 2014, there was a small decline; however, in 2015, the number of articles using quantitative approaches grew to 9. After reaching its maximum, the number of publications declined to 8 by 2020. In 2007, only a couple of studies used qualitative methods. The number climbed to 7 in 2014 and then decreased dramatically in 2017. In the last three years, the number has varied from 8 in 2019 to 2 in 2020.

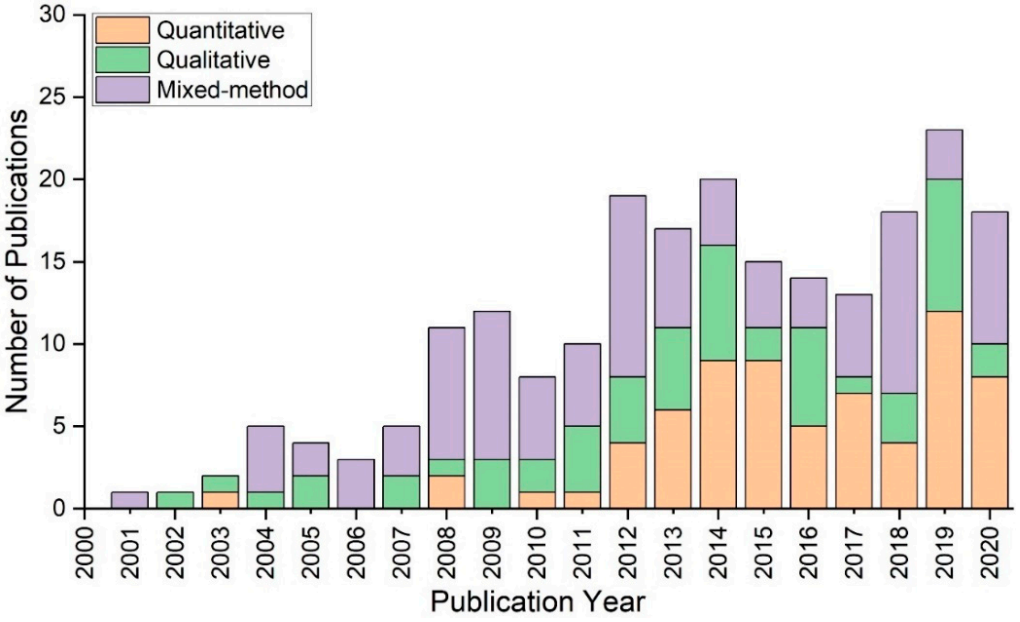


Figure 5. Number of studies employing quantitative, qualitative and mixed-method approaches between 2001 and 2020.

3.9. Bibliometric Analysis

As shown in Figure 6, the citation networks of articles are formed by keywords such as simulation (155), medical education (106), teamwork (52), anaesthesia (28), non-

technical skill (26), airway (25), cardiopulmonary resuscitation (21), and diagnosis (2). Remarkably, each network contains publications throughout the course of the time period. Simulation, the keyword from the core thematic trend, leads to technology, education, anaesthesia, error management, emergency, and preparedness—this is an example of how the central citation network has extended to spearheading research areas. Through research efforts on educational technology, communication, and cultural value, articles on teamwork have covered both the technological and social aspects. Up to this point, these networks have had a lower concentration. In contrast, medical education develops a more complex cluster despite being referenced less often. The second-largest cluster publishes articles in certain areas, such as high-fidelity simulation, management skills, guidelines, and resuscitation. This pattern also applies to other clusters with smaller numbers of publications. Anaesthesia is an important subcategory of study that led to the research fields of crisis resource management and safety. Similarly, non-technical skills, connected by clinical performance, assessment, and checklists, proceed to cognitive aid. Airways and diagnosis have created new research revenues in clusters away from their central counterparts, indicating a broader scale of medical simulations.

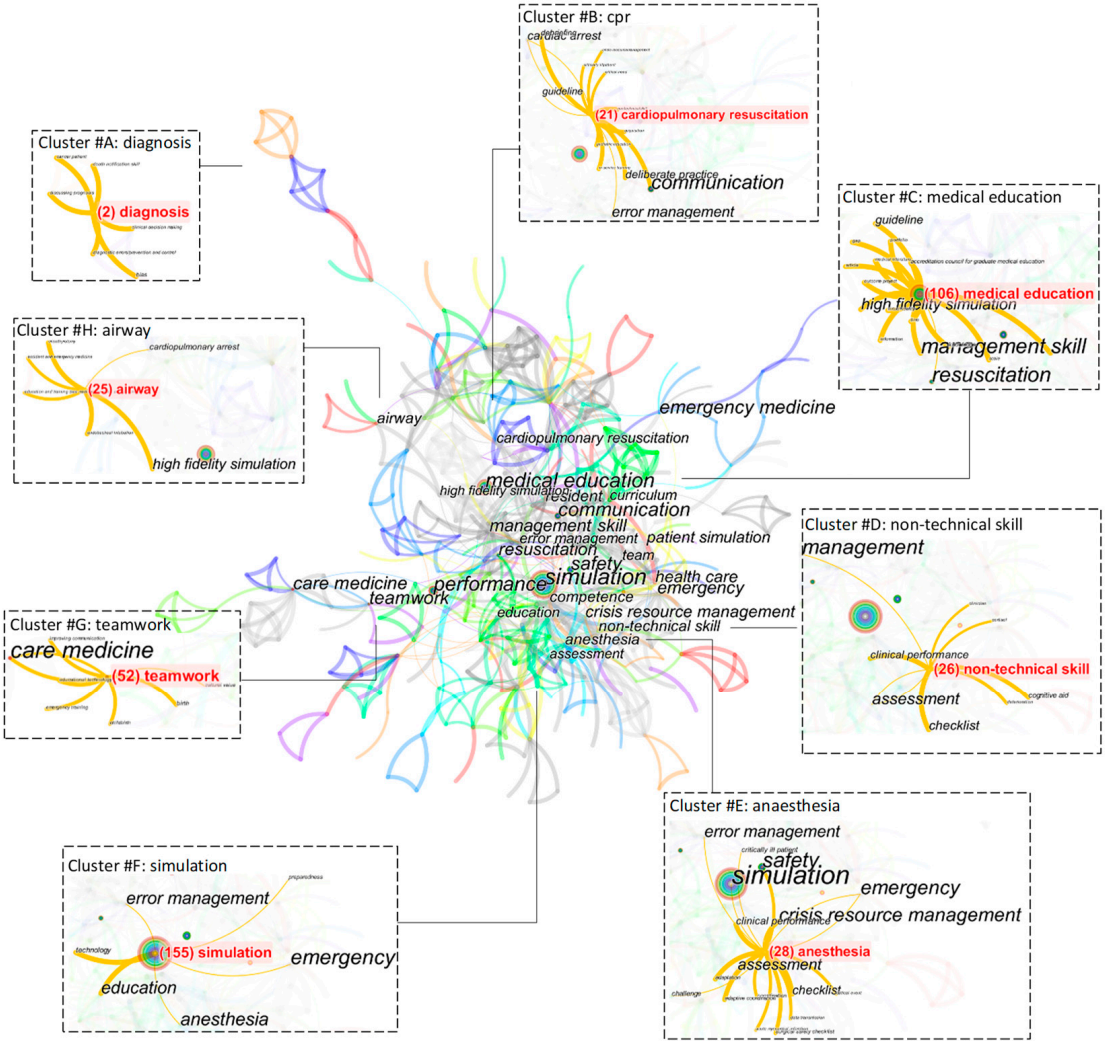


Figure 6. Cluster view of keyword concurrences between 2001 and 2020.

Figure 7 highlights institutional collaborations to illustrate the influence of academic centres searching for new areas. The visualisation consists of 58 nodes and 112 links during the time period. It is clear from the graph that Northeastern University and Harvard University are the most frequently collaborating partners in research activities. Particularly,

several renowned institutions serving as guiding hands—the Medical Simulation Centre, Columbia University, and Case Western Reserve University—have contributed to high-level research collaborations as part of a thriving international community. However, growing networks joined by European affiliations have recently piqued research interests. To summarise what has been stated so far, remarkable collaboration networks are gathered through universities, hospitals, and labs in North America.

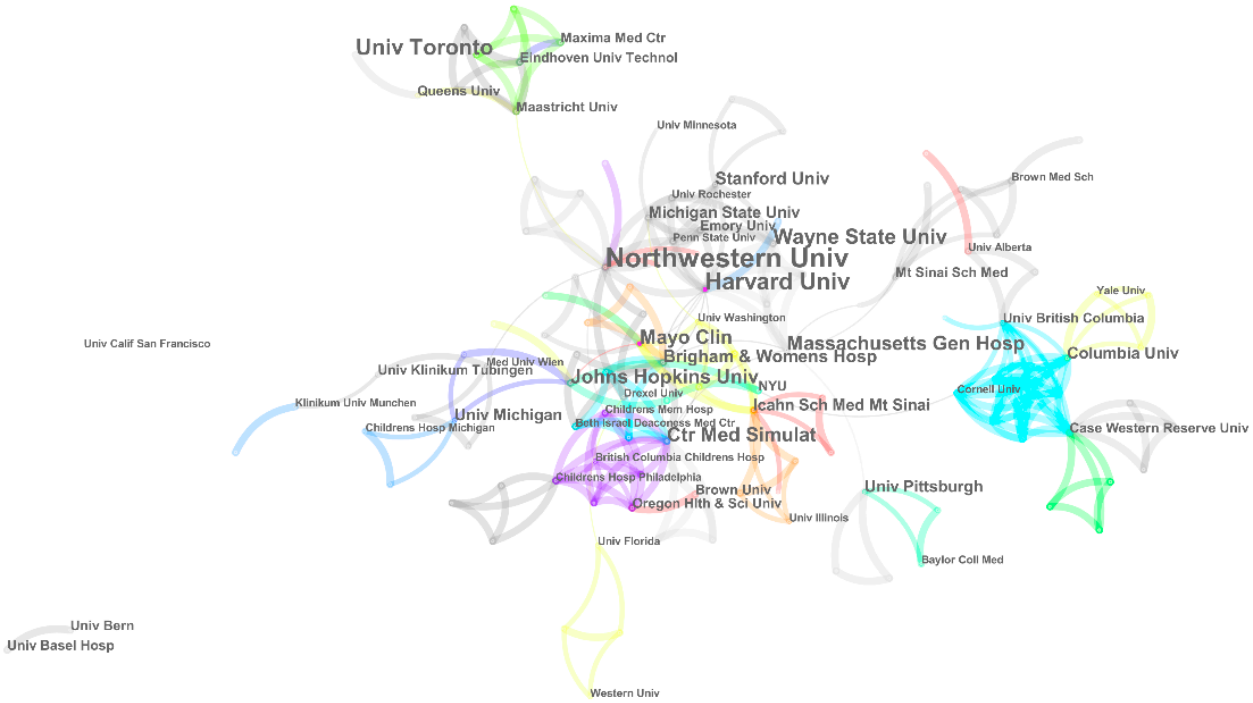


Figure 7. Cluster view of institutional collaborations between 2001 and 2020.

Figure 8 presents the timeline view of the CiteSpace map. The solid lines denote thematic horizons such as computer simulation, outcome, quality improvement, triage, patient safety, impact, randomised controlled trials, group decision-making, anaphylaxis, and management games, covering methodological and application-oriented perspectives. In addition, a group of phrases are identified as keywords to illustrate how they have changed over time. It is worthwhile to note that triage, impact, and randomised controlled trials exist throughout the time period. Prior to 2010, a preponderance of new ideas and approaches was created, as seen by the graph. The treatment of critically ill patients with anaphylaxis was inspired by the intersection of computer simulation and resuscitation. Simulation in the management game's thematic horizon continues with medical care and teamwork. Last but not least, later in the timeline, there are keywords such as "cognitive aids," "tools," "patients," and "programmes" on patient safety, triage, and computer simulation.

3.10. Ring Model

The literature study discovers no theoretical frameworks to synthesise previous research findings. To shed light on the linkages between medical simulations and experience design, which are promising to fertilise innovative ideas in both directions, this study presents a ring model as an integrated research framework (Figure 9). Amongst other things, debriefing is recognised as the main component to safeguard intended training goals, eliminate contextual limitations, and facilitate medical knowledge transfer to real working environments. It might be challenging to raise adjustments at each stage of the medical simulation study while also undergoing all stages of the ring model. However, these steps are necessary to concretise training outcomes in emergency medicine. In a nutshell, a medical simulation project is administered on the basis of all the design

considerations for functionally driven and effectively organised non-technical skills training activities.

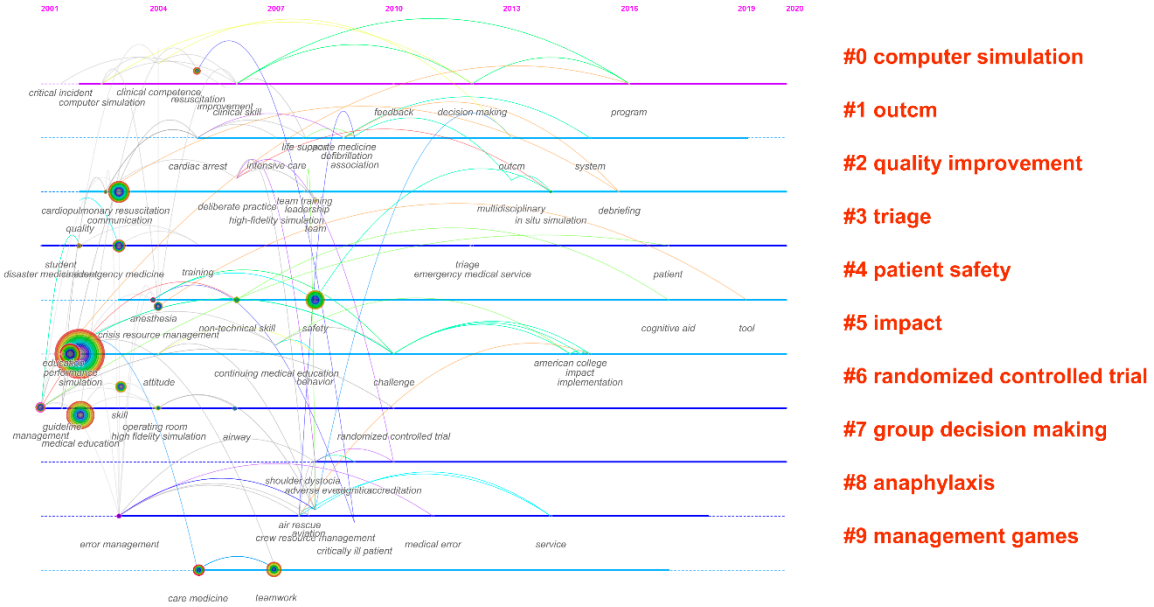


Figure 8. Timeline view of research thematic horizons and keyword changes between 2021 and 2020.

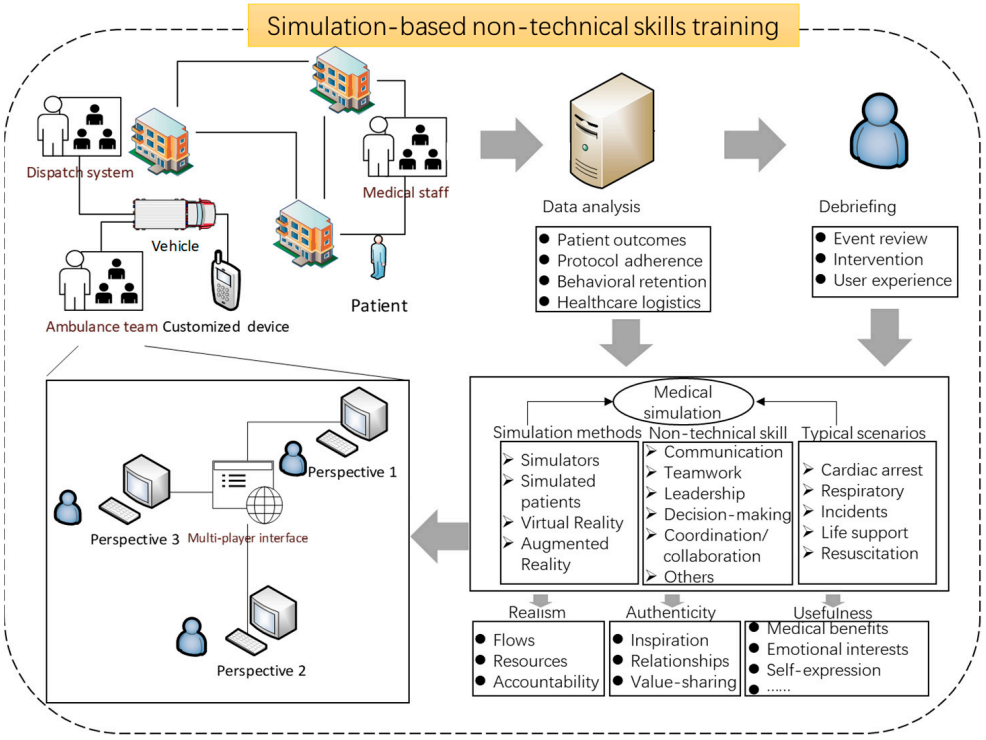


Figure 9. Ring model in the intersection between medical simulation, non-technical skills training and emergency medicine.

The diagram shows the five stages of instruction that are given to the participants. According to prior studies, realism in the initial stage directly links to the description of patient flows, resources, and accountability frameworks. Participants engage in medical simulations only if they receive a sense of authenticity from the constructs, value sharing, and inspirations between team members. Simulation methods include simulators, simulated patients, Virtual Reality, and Augmented Reality, depending on the learning

outcomes and objectives. Amongst other things, simulated patients are ideal for teaching communication, conflict management, compassion, and ethical dilemmas, whereas human simulators may be used to build therapeutic resilience. At this point, it is worthwhile to justify the application of simulation in terms of medical benefits, emotional interests, and self-expression. In light of this, data collection refers to gathering patient flow data, in accordance with the ethical agreement, to populate the simulation model. This is necessary to represent complicated and difficult cases. In the following stages, interprofessional teams are prepared for emergencies in a simulated setting. This is accomplished through mastering non-technical skills. Next, a data analysis is conducted using predetermined measures for patient outcomes, protocol adherence, behavioural retention, and healthcare logistics. The debriefing stage involves thought-provoking discussions in an iterative and retrospective process where team members learned from each other and from themselves.

If manipulators are employed, computer-assisted instruction has to be taken into account. The presence of engineers is also required. It is necessary to promptly and sensibly alter the physiological value in the teaching plan in response to the participants' performance as per the real circumstances in the classroom. The instructor may utilise role-playing approaches to teach empathy or ethical issues. By role-playing, after-views and debriefing, this ring model could accommodate the learning process.

The debriefing stage involves thought-provoking discussions in an iterative and retrospective process where team members learned from each other and from themselves. Various debriefing provisions might be subject to concerns that interruptions disturb fidelity and adversely affect learning. The author suggests a rigorous comparison of debriefing strategies with medical simulations to explore the effects on non-technical skills acquisition and learning experience.

4. Discussion

This section describes the high-yield topics for future research. The answers to these research questions will inform medical simulation instructors on how to appropriately organize training content and handle design issues.

4.1. Practice-Based Training and Improvement

The context brought to interprofessional situations can influence the degree of contact and the pace of training. It is vital to have an overview of each team member's skills and interests in order to respect altruism, culture, age, and gender. When aligning intended training goals, the first aspect that can be noted by instructors is their impact on the personnel undertaking interprofessional responsibility in medical simulations. A difference was made between the distribution of responsibilities among team members and the knowledge exchanges, according to MacNaughtonet et al.'s study [316]. In addition to the fundamentals of the medical system, participants need a comprehensive understanding of the activities and necessary skills to deliver excellent patient outcomes as the situation deteriorates. Even though patient scenarios could be supplied with task trainers [317], increasing the use of simulation in emergency medicine should allow the integration of skills that not only strives for professionalism but also clarify accountability frameworks in a dynamic process.

Although delivering quality and safe care within the purview of a single institution is of primary concern, it is also encouraged for networked medical institutions to approach more complex issues with interdependent threads. The majority of research has focused on non-technical skills training in a clinical environment with limited operational capacity. Nevertheless, multi-centred simulation initiatives have been conducted in an effort to establish stronger cross-institutional partnerships [46,103]. The delivery of training experiences is on the rise to promote the innovative use of information technology with a focus on system solutions. Instructors may now elicit hitherto splendid and overlapping processes into complete medical procedures and patient management plans. In addition, cross-institutional comparisons of training results may be undertaken to analyse the areas

that need to be improved in individual practice projects. This study posits the following question to be answered in future simulation projects:

- 'How can various agencies be brought together via simulation-based non-technical skills training?'
- 'How can medical simulations foster innovative strategies for addressing challenges that cannot be resolved independently?'

4.2. Teaching Theories and Educational Planning Models

Seldom did authors address teaching theories and educational planning models. However, it is becoming more essential to figure out how individuals receive, process, and retain information throughout learning. Kolb's Learning Cycle [318], also known as the Experiential Learning Cycle, could serve as the cornerstone for a learning-by-doing paradigm. According to the framework that is primarily used in nursing education [319], concrete experience, reflective observation, abstract conceptualization, and active experimentation are the four stages that must be completed for successful learning. Also, further study may broaden educational planning models for the development of practical courses. One such template could be Kern's six-step approach to clarify the intended learning outcomes of the overall programme and of individual sessions [320,321]. In such cases, the effective blending of the experience of learners together and instructional design is a keyword. The following research question should help researchers in the pursuit of a leaner-centred style:

- 'How do we apply teaching theories and major approaches to educational planning with medical simulations for non-technical skills training in emergency medicine?'

4.3. Medical Simulation Verification and Validation

Although certification in medical simulations is becoming more of a priority to identify best practices for a wide range of providers and applications [322], the credibility of medical simulation models remains largely underexplored. Barnes and Konia confirmed many different interpretations and accomplishments in healthcare simulation studies [323]. For example, Abir et al. developed a discrete-event simulation model to predict capacity bottlenecks at a medical centre [176], allowing for improved decision-making with changes in the working environment. However, rarely have such reviews been conducted in medical simulations—the majority of articles recreated tasks, cases, and scenarios rather than closely examining logistical aspects of emergency medicine. Most medical simulation studies currently lack an iterative model-building procedure. This warrants validation and verification throughout the operational requirements. The following research questions are outlined in order to ensure an accurate description of the medical system:

- 'What paradigms should be developed for verifying and validating medical simulations in emergency medicine?'
- 'How can instructors describe the logistical aspects of emergency medicine using real-time clinical data and patient inflow patterns?'

4.4. Applied Ergonomics

Medical equipment and apparatus used with simulators should take ergonomics and human factor engineering into account. However, the literature study reveals inadequate attempts to reduce fatigue, discomfort, and injury. Such aspects of applied ergonomics may be enhanced to reduce participant risk and better-fit training processes. This is a promising research domain since medical equipment must frequently be manoeuvred quickly and safely in different simulated scenarios.

Repeated exposure to high-fidelity simulations has turned out to be an effective teaching strategy [324]. It was shown that early exposure to a complex clinical environment was helpful for transitioning knowledge into practice [325]. Nevertheless, prior research has not demonstrated a correlation between repeated exposures and an increase in participant stress levels [326]. When the participant takes a considerable amount of experience in simulations, the relationship between the quantity of practice, the acquisition of non-

technical skills, and the impact on the sense of well-being should be elucidated from an ergonomic perspective.

Aside from quantitative research analysing the distributions of cognitive stress, it is promising for qualitative studies of focus groups to look for patterns or themes across entire datasets. Furthermore, mixed-method studies may help with data interpretation and broaden the generalizability. Therefore, it is worthwhile to answer the following question:

- 'How could technology-driven tools as user-centric design approaches overcome ergonomic issues with medical simulations?'

4.5. User Interface Design

In contrast to interactions with a conventional graphical user interface, which mostly involve using a mouse and keyboard, the next step in the evolution of user interfaces will make user interaction appear enjoyable, motivating, and intuitive. Researchers attempted scoring systems to measure multitasking skills in an emergency department [327] and address logistical bottlenecks in paediatric emergency medicine [328]. However, the literature study identifies only a few simulation projects that touched upon design issues. Due to a dearth of in-depth studies on user engagement and adoption, there is a lack of understanding of the expected actions from digital features. Designers should embrace such elements to improve the timeliness of task completion, reduce omissions, and pinpoint aspects of the user experience.

The user interface design will serve as a key component of next-generation simulators. This tendency requires the optimum usability, performance, and manoeuvrability of the digital media objectives. To date, the design patterns used in medical simulations have not been elucidated. Not only can user interface elements behave in specific ways, but there are also visual aesthetics, inclusion, and the adoption of habit-forming technologies, all of which contribute to a higher level of authenticity. Despite these promises, the interface needs to be suitable for medical system integration [329]. Given the lack of a detailed examination of user interface design, the following research question needs to be investigated:

- 'What is the cutting-edge innovation in interface design for the integration of function and usability?'

5. Conclusions

This literature study presents a synthesis of previous simulation projects that explicitly trained non-technical skills in emergency medicine. Over the decades, advances in a wide range of medical simulation categories have been made using scientific research evidence and statistical methods. These contributions addressed the intersections between medical simulations, non-technical skills training, and emergency medicine. In addition, the literature study reveals a substantial body of evidence-based practice that improves the design of training experiences for communication, teamwork, leadership, coordination, and decision-making. The presence of patient cases and the involvement of professionals showcase how the prior research design could be extended to more detailed patient scenarios. More importantly, simulation-based education should be considered as a teaching approach to substitute high-risk, rare, and complex situations in technical or situational simulations. In light of this, the ring model as an integrated framework is proposed for conceptualising the innovative design method—it aims for the transfer of simulation-based training outcomes to a real working environment.

It has been over two decades since the publication of the landmark report 'To Err Is Human: Building a Safer Health System' [330]. The growing awareness of medical mistakes is steering interest in teaching not just technical but also non-technical skills, an area of study that has received relatively little attention in general and in emergency medicine in particular. The medical system should be rethought as a social-technical system with processes and interactions across the medical pathways.

The literature study is subject to limitations. First of all, to avoid overlooking significant practice-based evidence, the search terms should combine keywords pertaining to the less often trained non-technical skills and more specifically employed research methods, respectively. In addition, despite using entries from the Web of Science Core Collection editions, the electronic data search may not be exhaustive. The omission of abstracts, conference proceedings, posters, and book reviews might lead to a selection bias in publications. Furthermore, the research only traced papers published after 2000. Attention to earlier articles may aid researchers in explaining the current status of the topic and pointing out a number of changes in the way the field is pioneered. In order to dive into the specifics, a previously proven methodology for profiling key variables in healthcare simulations [331], explored by earlier researchers, would benefit from visualising the design of queries, the use of search tools, and the evaluation of each article. Further literature studies shall reflect on lessons learned from the gradual shift towards competency-based medical education over the past decades, the meaningful presence of milestones and entrustable professional activities in medical behaviour [332], and how simulations in general have built surrounding heuristics into medical education.

Since the literature study is pioneering in this area, a synthesis of the outcomes over the past two decades outlines a broad array of research questions on the implementation of medical simulations in general and non-technical skills training in emergency medicine in particular. The need to capitalise on the characteristics of medical simulations warrants further investigations on practical training, validation and verification of medical simulations, user interface design, and applied ergonomics. These reflections on emerging research avenues should contribute to the body of knowledge on these underexplored areas. It is anticipated that future research will continue to deliver user-centric training experiences but will undertake an innovative design approach dedicated to the pursuit of performance excellence in simulated settings and longer retention of skills after completing the assignment. Last but not least, from a methodological standpoint, more qualitative studies should be carried out to streamline discourses from verbal, written, or language-use materials. Particularly, the application of thematic and content analysis, which has been largely unexplored in prior research, will help close the knowledge gap in the achievement of training goals and the provision of training experiences.

Funding: This work was supported by the Research Foundation for Youth Scholars of Beijing Technology and Business University.

Data Availability Statement: Data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest: The author declares no conflict of interest.

References

1. Al-Elq, A.H. Simulation-based medical teaching and learning. *J. Fam. Community Med.* **2010**, *17*, 35–40. [CrossRef]
2. Jun, J.B.; Jacobson, S.H.; Swisher, J.R. Application of Discrete-Event Simulation in Health Care Clinics: A Survey. *J. Oper. Res. Soc.* **1999**, *50*, 109–123. [CrossRef]
3. Mahaboob, S.; Lim, L.K.; Ng, C.L.; Ho, Q.Y.; Leow, M.E.; Lim, E.C. Developing the 'NUS Tummy Dummy', A Low-Cost Simulator to Teach Medical Students to Perform the Abdominal Examination. *Ann. Acad. Med. Singap.* **2010**, *39*, 150–151. [CrossRef] [PubMed]
4. Tsai, T.-C.; Harasym, P.H.; Nijssen-Jordan, C.; Jennett, P. Learning gains derived from a high-fidelity mannequin-based simulation in the pediatric emergency department. *J. Formos. Med. Assoc. Taiwan Yi Zhi* **2006**, *105*, 94–98. [CrossRef]
5. Ayhan, A.G.Y.; Çekiç, Y.; Ançel, G. Psychiatric nursing education: Films and reflections. *Anatol. J. Psychiatry* **2018**, *19*, 362–369. [CrossRef]
6. Parsi, K.; Elster, N. 'You took an Oath!': Engaging Medical Students About the Importance of Oaths and Codes Through Film and Television. *HEC Forum Interdiscip. J. Hosp. Ethical Leg. Issues* **2020**, *32*, 175–189. [CrossRef]
7. Gaspar, J.S.; Santos, M.R.; Reis, Z.S.N. A Clinical Case Simulation Tool for Medical Education. In *Information Technology in Bio- and Medical Informatics*; Springer: Cham, Switzerland, 2016; pp. 141–150. [CrossRef]

8. Bokken, L.; Rethans, J.-J.; van Heurn, L.; Duvivier, R.; Scherpbier, A.; van der Vleuten, C. Students' views on the use of real patients and simulated patients in undergraduate medical education. *Acad. Med. J. Assoc. Am. Med. Coll.* **2009**, *84*, 958–963. [CrossRef]
9. Dadiz, R.; Weinschreider, J.; Schriefer, J.; Arnold, C.; Greves, C.D.; Crosby, E.C.; Wang, H.; Pressman, E.K.; Guillet, R. Interdisciplinary Simulation-Based Training to Improve Delivery Room Communication. *Simul. Healthc. J. Soc. Simul. Healthc.* **2013**, *8*, 279–291. [CrossRef]
10. Herzberg, S.; Hansen, M.; Schoonover, A.; Skarica, B.; McNulty, J.; Harrod, T.; Snowden, J.M.; Lambert, W.; Guise, J.-M. Association between measured teamwork and medical errors: An observational study of prehospital care in the USA. *BMJ Open* **2019**, *9*, e025314. [CrossRef]
11. Rosenman, E.; Vrablik, M.; Brolliar, S.; Chipman, A.; Fernandez, R. Targeted Simulation-based Leadership Training for Trauma Team Leaders. *West. J. Emerg. Med.* **2019**, *20*, 520–526. [CrossRef]
12. Ten Eyck, R.P.; Tews, M.; Ballester, J.M.; Hamilton, G.C. Improved Fourth-Year Medical Student Clinical Decision-Making Performance as a Resuscitation Team Leader after a Simulation-Based Curriculum. *Simul. Healthc. J. Soc. Simul. Healthc.* **2010**, *5*, 139–145. [CrossRef] [PubMed]
13. Dichter, J.R.; Kanter, R.K.; Dries, D.; Luyckx, V.; Lim, M.L.; Wilgis, J.; Anderson, M.R.; Sarani, B.; Hupert, N.; Mutter, R.; et al. System-level planning, coordination, and communication: Care of the critically ill and injured during pandemics and disasters: CHEST consensus statement. *Chest* **2014**, *146*, e87S–e102S. [CrossRef] [PubMed]
14. Caners, K.; Baylis, J.; Heyd, C.; Chan, T. Sharing is caring: How EM Sim Cases (EMSimCases.com) has created a collaborative simulation education culture in Canada. *Can. J. Emerg. Med.* **2020**, *22*, 819–821. [CrossRef] [PubMed]
15. Schulte-Uentrop, L.; Cronje, J.S.; Zöllner, C.; Kubitz, J.C.; Sehner, S.; Moll-Khosrawi, P. Correlation of medical students' situational motivation and performance of non-technical skills during simulation-based emergency training. *BMC Med. Educ.* **2020**, *20*, 351. [CrossRef]
16. Haffner, L.; Mahling, M.; Muench, A.; Castan, C.; Schubert, P.; Naumann, A.; Reddersen, S.; Herrmann-Werner, A.; Reutershan, J.; Riessen, R.; et al. Improved recognition of ineffective chest compressions after a brief Crew Resource Management (CRM) training: A prospective, randomised simulation study. *BMC Emerg. Med.* **2016**, *17*, 7. [CrossRef] [PubMed]
17. Snell, L.S.; Frank, J.R. Competencies, the tea bag model, and the end of time. *Med. Teach.* **2010**, *32*, 629–630. [CrossRef] [PubMed]
18. McGaghie, W.C.; Sajid, A.W.; Miller, G.E.; Telder, T.V.; Lipson, L.; World Health Organization. Competency-Based Curriculum Development in Medical Education: An Introduction. 1978. Available online: https://apps.who.int/iris/handle/10665/39703 (accessed on 13 February 2023).
19. Lurie, S.J.; Mooney, C.J.; Lyness, J.M. Measurement of the general competencies of the accreditation council for graduate medical education: A systematic review. *Acad. Med. J. Assoc. Am. Med. Coll.* **2009**, *84*, 301–309. [CrossRef] [PubMed]
20. Chen, W.-T.; Kang, Y.-N.; Wang, T.-C.; Lin, C.-W.; Cheng, C.-Y.; Suk, F.-M.; Hsu, C.-W.; Huang, S.-K.; Huang, W.-C. Does ultrasound education improve anatomy learning? Effects of the Parallel Ultrasound Hands-on (PUSH) undergraduate medicine course. *BMC Med. Educ.* **2022**, *22*, 207. [CrossRef]
21. Lin, H.-C.; Hwang, G.-J.; Chou, K.-R.; Tsai, C.-K. Fostering complex professional skills with interactive simulation technology: A virtual reality-based flipped learning approach. *Br. J. Educ. Technol.* **2023**, *54*, 622–641. [CrossRef]
22. Lin, H.C.; Hwang, G.J. Research trends of flipped classroom studies for medical courses: A review of journal publications from 2008 to 2017 based on the technology-enhanced learning model. *Interact. Learn. Environ.* **2019**, *27*, 1011–1027. [CrossRef]
23. Shapiro, M.J. Simulation based teamwork training for emergency department staff: Does it improve clinical team performance when added to an existing didactic teamwork curriculum? *Qual. Saf. Health Care* **2004**, *13*, 417–421. [CrossRef] [PubMed]
24. Ostergaard, H.T.; Ostergaard, D.; Lippert, A. Implementation of team training in medical education in Denmark. *Postgrad. Med. J.* **2008**, *84*, 507–511. [CrossRef] [PubMed]
25. Zhang, C.; Zhang, C.; Grandits, T.; Härenstam, K.P.; Hauge, J.B.; Meijer, S. A systematic literature review of simulation models for non-technical skill training in healthcare logistics. *Adv. Simul. Lond. Engl.* **2018**, *3*, 15. [CrossRef] [PubMed]
26. Chen, C. CiteSpace II: Detecting and visualizing emerging trends and transient patterns in scientific literature. *J. Am. Soc. Inf. Sci. Technol.* **2006**, *57*, 359–377. [CrossRef]
27. Su, C.-J.; Pan, S.-W.; Huang, L.-J.; Yang, L.-Y.; Yang, Y.-Y.; Hwang, S.-J.; Chuang, C.-L.; Chang, C.-C.; Huang, H.-C.; Kao, S.-Y.; et al. Trios-OSCE-based simulation course enhances the subcompetency of emergency-stabilization for postgraduate year-1 residents. *J. Chin. Med. Assoc.* **2019**, *82*, 407–412. [CrossRef] [PubMed]
28. Henn, P.; Power, D.; Smith, S.D.; Power, T.; Hynes, H.; Gaffney, R.; McAdoo, J.D. A metric-based analysis of structure and content of telephone consultations of final-year medical students in a high-fidelity emergency medicine simulation. *BMJ Open* **2012**, *2*, e001298. [CrossRef] [PubMed]
29. Paul, G.; Lane, E. Inside the Debriefing Room: Multidisciplinary Rapid Response Team Training Findings Revealed. *Clin. Simul. Nurs.* **2014**, *10*, e227–e233. [CrossRef]
30. Fernandez, R.; Pearce, M.; Grand, J.A.; Rench, T.A.; Jones, K.A.; Chao, G.T.; Kozlowski, S.W.J. Evaluation of a Computer-Based Educational Intervention to Improve Medical Teamwork and Performance During Simulated Patient Resuscitations. *Crit. Care Med.* **2013**, *41*, 2551–2562. [CrossRef]
31. McGaghie, W.C.; Barsuk, J.H.; Cohen, E.R.; Kristopaitis, T.; Wayne, D.B. Dissemination of an Innovative Mastery Learning Curriculum Grounded in Implementation Science Principles: A Case Study. *Acad. Med.* **2015**, *90*, 1487–1494. [CrossRef]

32. Armbruster, W.; Kubulus, D.; Schlechtriemen, T.; Adler, J.; Höhn, M.; Schmidt, D.; Duchêne, S.; Steiner, P.; Volk, T.; Wrobel, M. Verbesserung der Notarztausbildung durch Simulatortraining: Betrachtung anhand des Modellprojekts "NASimSaar25". *Anaesthesist* **2014**, *63*, 691–696. [CrossRef]
33. Stone, K.; Reid, J.; Caglar, D.; Christensen, A.; Strelitz, B.; Zhou, L.; Quan, L. Increasing pediatric resident simulated resuscitation performance: A standardized simulation-based curriculum. *Resuscitation* **2014**, *85*, 1099–1105. [CrossRef] [PubMed]
34. Dermody, S.M.; Masciello, M.; Malekzadeh, S. A Multispecialty Critical Airway Simulation Course for Medical Students. *Laryngoscope* **2021**, *131*, 1482–1486. [CrossRef] [PubMed]
35. Zimmer, M.; Wassmer, R.; Latasch, L.; Oberndörfer, D.; Wilken, V.; Ackermann, H.; Breitkreutz, R. Initiation of risk management: Incidence of failures in simulated emergency medical service scenarios. *Resuscitation* **2010**, *81*, 882–886. [CrossRef] [PubMed]
36. West, C.; Landry, K.; Graham, A.; Graham, L.; Cianciolo, A.T.; Kalet, A.; Rosen, M.; Sherman, D.W. Conceptualizing Interprofessional Teams as Multi-Team Systems—Implications for Assessment and Training. *Teach. Learn. Med.* **2015**, *27*, 366–369. [CrossRef]
37. Couto, T.B.; Kerrey, B.T.; Taylor, R.G.; FitzGerald, M.; Geis, G.L. Teamwork Skills in Actual, In Situ, and In-Center Pediatric Emergencies: Performance Levels Across Settings and Perceptions of Comparative Educational Impact. *Simul. Healthc. J. Soc. Simul. Healthc.* **2015**, *10*, 76–84. [CrossRef]
38. Lischke, V.; Berner, A.; Pietsch, U.; Schiffer, J.; Ney, L. Medizinisches Simulationstraining luftgestützter Bergrettungseinsätze (MedSim-BW-ZSA). *Notf. Rett.* **2014**, *17*, 46–52. [CrossRef]
39. Gerard, J.M.; Scalzo, A.J.; Borgman, M.A.; Watson, C.M.; Byrnes, C.E.; Chang, T.P.; Auerbach, M.; Kessler, D.O.; Feldman, B.L.; Payne, B.S.; et al. Validity Evidence for a Serious Game to Assess Performance on Critical Pediatric Emergency Medicine Scenarios. *Simul. Healthc. J. Soc. Simul. Healthc.* **2018**, *13*, 168–180. [CrossRef]
40. Greci, L.S.; Ramloll, R.; Hurst, S.; Garman, K.; Beedasy, J.; Pieper, E.B.; Huang, R.; Higginbotham, E.; Agha, Z. vTrain: A Novel Curriculum for Patient Surge Training in a Multi-User Virtual Environment (MUVE). *Prehospital Disaster Med.* **2013**, *28*, 215–222. [CrossRef]
41. Ingrassia, P.L.; Ragazzoni, L.; Tengattini, M.; Carenzo, L.; Della Corte, F. Nationwide Program of Education for Undergraduates in the Field of Disaster Medicine: Development of a Core Curriculum Centered on Blended Learning and Simulation Tools. *Prehospital Disaster Med.* **2014**, *29*, 508–515. [CrossRef]
42. West, E.; Singer-Chang, G.; Ryznar, R.; Ross, D.; Czekajlo, M.; Hoang, T.; Alson, R.; Berbel, G.; Moloff, A.; Safaoui, M.; et al. The Effect of Hyper-Realistic Trauma Training on Emotional Intelligence in Second Year Military Medical Students. *J. Surg. Educ.* **2020**, *77*, 1422–1428. [CrossRef]
43. Ripoll-Gallardo, A.; Ragazzoni, L.; Mazzanti, E.; Meneghetti, G.; Franc, J.M.; Costa, A.; della Corte, F. Residents working with Médecins Sans Frontières: Training and pilot evaluation. *Scand. J. Trauma Resusc. Emerg. Med.* **2020**, *28*, 86. [CrossRef] [PubMed]
44. Hall, C.; Robertson, D.; Rolfe, M.; Pascoe, S.; Passey, M.E.; Pit, S.W. Do cognitive aids reduce error rates in resuscitation team performance? Trial of emergency medicine protocols in simulation training (TEMPIST) in Australia. *Hum. Resour. Health* **2020**, *18*, 1. [CrossRef] [PubMed]
45. McKenzie, C.T.; Tilashalski, K.; Abou-Arraj, R.; Peterson, D.T.; White, M.L. Students' Evaluations of Simulations in Dentistry: A Multiple Cohort Study at a U.S. Dental School. *J. Dent. Educ.* **2019**, *83*, 1142–1150. [CrossRef]
46. Bohmann, F.O.; Kurka, N.; du Mesnil de Rochemont, R.; Gruber, K.; Guenther, J.; Rostek, P.; Rai, H.; Zickler, P.; Ertl, M.; Berlis, A.; et al. Simulation-Based Training of the Rapid Evaluation and Management of Acute Stroke (STREAM)—A Prospective Single-Arm Multicenter Trial. *Front. Neurol.* **2019**, *10*, 969. [CrossRef]
47. Lau, Y.; Chee, D.G.H.; Ab Hamid, Z.B.; Leong, B.S.-H.; Lau, S.T. Interprofessional Simulation–Based Advanced Cardiac Life Support Training: Video-Based Observational Study. *Clin. Simul. Nurs.* **2019**, *30*, 16–24. [CrossRef]
48. Nguyen, L.H.P.; Bank, I.; Fisher, R.; Mascarella, M.; Young, M. Managing the airway catastrophe: Longitudinal simulation-based curriculum to teach airway management. *J. Otolaryngol.—Head Neck Surg.* **2019**, *48*, 10. [CrossRef] [PubMed]
49. D'Asta, F.; Homsi, J.; Sforzi, I.; Wilson, D.; de Luca, M. 'SIMBurns': A high-fidelity simulation program in emergency burn management developed through international collaboration. *Burns* **2019**, *45*, 120–127. [CrossRef]
50. Hogg, E.S.; Kinshuck, A.J.; Littley, N.; Lau, A.; Tandon, S.; Lancaster, J. A high-fidelity, fully immersive simulation course to replicate ENT and head and neck emergencies. *J. Laryngol. Otol.* **2019**, *133*, 115–118. [CrossRef]
51. Jong, M.; Elliott, N.; Nguyen, M.; Goyke, T.; Johnson, S.; Cook, M.; Lindauer, L.; Best, K.; Gernerd, D.; Morolla, L.; et al. Assessment of Emergency Medicine Resident Performance in an Adult Simulation Using a Multisource Feedback Approach. *West. J. Emerg. Med.* **2018**, *20*, 64–70. [CrossRef]
52. Liu, Y.; Zhang, Y.; Zhang, L.; Bai, H.; Wang, G.; Guo, L. The impact of SimMan on resident training in emergency skills. *Medicine* **2019**, *98*, e13930. [CrossRef]
53. Bragard, I.; Seghaye, M.-C.; Farhat, N.; Solowianiuk, M.; Saliba, M.; Etienne, A.-M.; Schumacher, K. Implementation of a 2-Day Simulation-Based Course to Prepare Medical Graduates on Their First Year of Residency. *Pediatr. Emerg. Care* **2018**, *34*, 857–861. [CrossRef] [PubMed]
54. Wu, K.Y.; Kim, S.; Fung, K.; Roth, K. Assessing nontechnical skills in otolaryngology emergencies through simulation-based training: Nontechnical Skills in OTO-HNS. *Laryngoscope* **2018**, *128*, 2301–2306. [CrossRef] [PubMed]
55. Ghazali, D.A.; Darmian-Rafei, I.; Ragot, S.; Oriot, D. Performance under Stress Conditions during Multidisciplinary Team Immersive Pediatric Simulations. *Pediatr. Crit. Care Med.* **2018**, *19*, e270–e278. [CrossRef] [PubMed]

56. Kumar, A.; Sturrock, S.; Wallace, E.M.; Nestel, D.; Lucey, D.; Stoyles, S.; Morgan, J.; Neil, P.; Schlipalius, M.; Dekoninck, P. Evaluation of learning from Practical Obstetric Multi-Professional Training and its impact on patient outcomes in Australia using Kirkpatrick's framework: A mixed methods study. *BMJ Open* **2018**, *8*, e017451. [CrossRef] [PubMed]
57. Eisenmann, D.; Stroben, F.; Gerken, J.; Exadaktylos, A.; Machner, M.; Hautz, W. Interprofessional Emergency Training Leads to Changes in the Workplace. *West. J. Emerg. Med.* **2018**, *19*, 185–192. [CrossRef]
58. Jakobsen, R.B.; Gran, S.F.; Grimsmo, B.; Arntzen, K.; Fosse, E.; Frich, J.C.; Hjortdahl, P. Examining participant perceptions of an interprofessional simulation-based trauma team training for medical and nursing students. *J. Interprof. Care* **2018**, *32*, 80–88. [CrossRef] [PubMed]
59. Lavelle, M.; Abthorpe, J.; Simpson, T.; Reedy, G.; Little, F.; Banerjee, A. MBRRACE in simulation: An evaluation of a multi-disciplinary simulation training for medical emergencies in obstetrics (MEmO). *J. Obstet. Gynaecol.* **2018**, *38*, 781–788. [CrossRef]
60. Parsons, J.; Crichlow, A.; Ponnuru, S.; Shewokis, P.; Goswami, V.; Griswold, S. Filling the Gap: Simulation-based Crisis Resource Management Training for Emergency Medicine Residents. *West. J. Emerg. Med.* **2018**, *19*, 205–210. [CrossRef]
61. Espey, E.; Baty, G.; Rask, J.; Chungtuyco, M.; Pereda, B.; Leeman, L. Emergency in the clinic: A simulation curriculum to improve outpatient safety. *Am. J. Obstet. Gynecol.* **2017**, *217*, e1–e699. [CrossRef]
62. Freytag, J.; Stroben, F.; Hautz, W.E.; Eisenmann, D.; Kämmer, J.E. Improving patient safety through better teamwork: How effective are different methods of simulation debriefing? Protocol for a pragmatic, prospective and randomised study. *BMJ Open* **2017**, *7*, e015977. [CrossRef]
63. Fernando, A.; Attoe, C.; Jaye, P.; Cross, S.; Pathan, J.; Wessely, S. Improving Interprofessional Approaches to Physical and Psychiatric Comorbidities Through Simulation. *Clin. Simul. Nurs.* **2017**, *13*, 186–193. [CrossRef]
64. Ayub, E.M.; Sampayo, E.M.; Shah, M.I.; Doughty, C.B. Prehospital Providers' Perceptions on Providing Patient and Family Centered Care. *Prehosp. Emerg. Care* **2017**, *21*, 233–241. [CrossRef] [PubMed]
65. Lutgendorf, M.A.; Spalding, C.; Drake, E.; Spence, D.; Heaton, J.O.; Morocco, K.V. Multidisciplinary In Situ Simulation-Based Training as a Postpartum Hemorrhage Quality Improvement Project. *Mil. Med.* **2017**, *182*, e1762–e1766. [CrossRef] [PubMed]
66. Kerner, R.L.; Gallo, K.; Cassara, M.; D'Angelo, J.; Egan, A.; Simmons, J.G. Simulation for Operational Readiness in a New Freestanding Emergency Department: Strategy and Tactics. *Simul. Healthc. J. Soc. Simul. Healthc.* **2016**, *11*, 345–356. [CrossRef] [PubMed]
67. Bourgeon, L.; Bensalah, M.; Vacher, A.; Ardouin, J.C.; Debien, B. Role of emotional competence in residents' simulated emergency care performance: A mixed-methods study. *BMJ Qual. Saf.* **2016**, *25*, 364–371. [CrossRef]
68. Wong, A.H.-W.; Gang, M.; Szyld, D.; Mahoney, H. Making an 'Attitude Adjustment': Using a Simulation-Enhanced Interprofessional Education Strategy to Improve Attitudes toward Teamwork and Communication. *Simul. Healthc. J. Soc. Simul. Healthc.* **2016**, *11*, 117–125. [CrossRef]
69. Dieterich, F.; Kanstinger, A.; Erdmann, M.; Knebel, J.; Ott, B.; Schöppenthau, H. Implementierung eines regelmäßigen Reanimationstrainings an einem Druckkammerzentrum. *Anaesthesist* **2016**, *65*, 203–211. [CrossRef]
70. Niell, B.L.; Kattapuram, T.; Halpern, E.F.; Salazar, G.M.; Penzias, A.; Bonk, S.S.; Forde, J.C.; Hayden, E.; Sande, M.; Minehart, R.D.; et al. Prospective Analysis of an Interprofessional Team Training Program Using High-Fidelity Simulation of Contrast Reactions. *Am. J. Roentgenol.* **2015**, *204*, W670–W676. [CrossRef]
71. Cortegiani, A.; Russotto, V.; Montalto, F.; Iozzo, P.; Palmeri, C.; Raineri, S.M.; Giarratano, A. Effect of High-Fidelity Simulation on Medical Students' Knowledge about Advanced Life Support: A Randomized Study. *PLoS ONE* **2015**, *10*, e0125685. [CrossRef]
72. Duffy, M.C.; Azevedo, R.; Sun, N.-Z.; Griscom, S.E.; Stead, V.; Crelinsten, L.; Wiseman, J.; Maniatis, T.; Lachapelle, K. Team regulation in a simulated medical emergency: An in-depth analysis of cognitive, metacognitive, and affective processes. *Instr. Sci.* **2015**, *43*, 401–426. [CrossRef]
73. Semler, M.W.; Keriwala, R.D.; Clune, J.K.; Rice, T.W.; Pugh, M.E.; Wheeler, A.P.; Miller, A.N.; Banerjee, A.; Terhune, K.; Bastarache, J.A. A Randomized Trial Comparing Didactics, Demonstration, and Simulation for Teaching Teamwork to Medical Residents. *Ann. Am. Thorac. Soc.* **2015**, *12*, 512–519. [CrossRef] [PubMed]
74. Nicksa, G.A.; Anderson, C.; Fidler, R.; Stewart, L. Innovative Approach Using Interprofessional Simulation to Educate Surgical Residents in Technical and Nontechnical Skills in High-Risk Clinical Scenarios. *JAMA Surg.* **2015**, *150*, 201. [CrossRef] [PubMed]
75. Tallentire, V.R.; Smith, S.E.; Skinner, J.; Cameron, H.S. Exploring patterns of error in acute care using framework analysis. *BMC Med. Educ.* **2015**, *15*, 3. [CrossRef] [PubMed]
76. Giuliani, M.; Gillan, C.; Wong, O.; Harnett, N.; Milne, E.; Moseley, D.; Thompson, R.; Catton, P.; Bissonnette, J.-P. Evaluation of high-fidelity simulation training in radiation oncology using an outcomes logic model. *Radiat. Oncol.* **2014**, *9*, 189. [CrossRef]
77. Kowitlawakul, Y.; Ignacio, J.; Lahiri, M.; Khoo, S.M.; Zhou, W.; Soon, D. Exploring new healthcare professionals' roles through interprofessional education. *J. Interprof. Care* **2014**, *28*, 267–269. [CrossRef]
78. Lammers, R.; Willoughby-Byrwa, M.; Fales, W. Medication Errors in Prehospital Management of Simulated Pediatric Anaphylaxis. *Prehosp. Emerg. Care* **2014**, *18*, 295–304. [CrossRef]
79. Arriaga, A.F.; Gawande, A.A.; Raemer, D.B.; Jones, D.B.; Smink, D.S.; Weinstock, P.; Dwyer, K.; Lipsitz, S.R.; Peyre, S.; Pawlowski, J.B.; et al. Pilot Testing of a Model for Insurer-Driven, Large-Scale Multicenter Simulation Training for Operating Room Teams. *Ann. Surg.* **2014**, *259*, 403–410. [CrossRef]
80. Kalsi, A.S.; Higham, H.; McKnight, M.; Dhariwal, D.K. Simulation training for dental foundation in oral and maxillofacial surgery—A new benchmark. *Br. Dent. J.* **2013**, *215*, 571–576. [CrossRef]

81. Kennedy, J.L.; Jones, S.M.; Porter, N.; White, M.L.; Gephardt, G.; Hill, T.; Cantrell, M.; Nick, T.G.; Melguizo, M.; Smith, C.; et al. High-Fidelity Hybrid Simulation of Allergic Emergencies Demonstrates Improved Preparedness for Office Emergencies in Pediatric Allergy Clinics. *J. Allergy Clin. Immunol. Pract.* **2013**, *1*, 608–617.e14. [CrossRef]
82. Uy, J.; White, D.B.; Mohan, D.; Arnold, R.M.; Barnato, A.E. Physicians' Decision-Making Roles for an Acutely Unstable Critically and Terminally Ill Patient. *Crit. Care Med.* **2013**, *41*, 1511–1517. [CrossRef]
83. Luctkar-Flude, M.; Baker, C.; Medves, J.; Tsai, E.; Rivard, L.; Goyer, M.-C.; Krause, A. Evaluating An Interprofessional Pediatrics Educational Module Using Simulation. *Clin. Simul. Nurs.* **2013**, *9*, e163–e169. [CrossRef]
84. Rörtgen, D.; Bergrath, S.; Rossaint, R.; Beckers, S.K.; Fischermann, H.; Na, I.-S.; Peters, D.; Fitzner, C.; Skorning, M. Comparison of physician staffed emergency teams with paramedic teams assisted by telemedicine—A randomized, controlled simulation study. *Resuscitation* **2013**, *84*, 85–92. [CrossRef] [PubMed]
85. Sigalet, E.; Donnon, T.; Grant, V. Undergraduate Students' Perceptions of and Attitudes toward a Simulation-Based Interprofessional Curriculum: The KidSIM ATTITUDES Questionnaire. *Simul. Healthc. J. Soc. Simul. Healthc.* **2012**, *7*, 353–358. [CrossRef]
86. Dagnone, J.D.; Takhar, A.; Lacroix, L. The Simulation Olympics: A resuscitation-based simulation competition as an educational intervention. *Can. J. Emerg. Med.* **2012**, *14*, 363–368. [CrossRef] [PubMed]
87. Hicks, C.M.; Kiss, A.; Bandiera, G.W.; Denny, C.J. Crisis Resources for Emergency Workers (CREW II): Results of a pilot study and simulation-based crisis resource management course for emergency medicine residents. *Can. J. Emerg. Med.* **2012**, *14*, 354–362. [CrossRef] [PubMed]
88. Fransen, A.; van de Ven, J.; Merién, A.; de Wit-Zuurendonk, L.; Houterman, S.; Mol, B.; Oei, S. Effect of obstetric team training on team performance and medical technical skills: A randomised controlled trial: Effectiveness of obstetric team training. *BJOG Int. J. Obstet. Gynaecol.* **2012**, *119*, 1387–1393. [CrossRef] [PubMed]
89. Stiegler, M.P.; Neelankavil, J.P.; Canales, C.; Dhillon, A. Cognitive errors detected in anaesthesiology: A literature review and pilot study. *Br. J. Anaesth.* **2012**, *108*, 229–235. [CrossRef]
90. Sadosty, A.T.; Bellolio, M.F.; Laack, T.A.; Luke, A.; Weaver, A.; Goyal, D.G. Simulation-based Emergency Medicine Resident Self-Assessment. *J. Emerg. Med.* **2011**, *41*, 679–685. [CrossRef]
91. Cuttano, A.; Scaramuzzo, R.T.; Gentile, M.; Ciantelli, M.; Sigali, E.; Boldrini, A. Education in neonatology by simulation: Between reality and declaration of intent. *J. Matern. Fetal Neonatal Med.* **2011**, *24*, 97–98. [CrossRef]
92. Sistino, J.; Michaud, N.; Sievert, A.; Shackelford, A. Incorporating high fidelity simulation into perfusion education. *Perfusion* **2011**, *26*, 390–394. [CrossRef]
93. Weller, J.; Frengley, R.; Torrie, J.; Shulruf, B.; Jolly, B.; Hopley, L.; Hendersdon, K.; Dzendrowskyj, P.; Yee, B.; Paul, A. Evaluation of an instrument to measure teamwork in multidisciplinary critical care teams. *BMJ Qual. Saf.* **2011**, *20*, 216–222. [CrossRef] [PubMed]
94. Siassakos, D.; Draycott, T.; O'Brien, K.; Kenyon, C.; Bartlett, C.; Fox, R. Exploratory Randomized Controlled Trial of Hybrid Obstetric Simulation Training for Undergraduate Students. *Simul. Healthc. J. Soc. Simul. Healthc.* **2010**, *5*, 193–198. [CrossRef] [PubMed]
95. Williams, J.B.; McDonough, M.A.; Hilliard, M.W.; Williams, A.L.; Cuniowski, P.C.; Gonzalez, M.G. Intermethod Reliability of Real-time Versus Delayed Videotaped Evaluation of a High-fidelity Medical Simulation Septic Shock Scenario. *Acad. Emerg. Med.* **2009**, *16*, 887–893. [CrossRef]
96. Yee, B.; Naik, V.N.; Joo, H.S.; Savoldelli, G.L.; Chung, D.Y.; Houston, P.L.; Karatzoglou, B.J.; Hamstra, S.J. Nontechnical Skills in Anesthesia Crisis Management with Repeated Exposure to Simulation-based Education. *Anesthesiology* **2005**, *103*, 241–248. [CrossRef]
97. Tschan, F.; Semmer, N.K.; Gurtner, A.; Bizzari, L.; Spychiger, M.; Breuer, M.; Marsch, S.U. Explicit Reasoning, Confirmation Bias, and Illusory Transactive Memory: A Simulation Study of Group Medical Decision Making. *Small Group Res.* **2009**, *40*, 271–300. [CrossRef]
98. Bogenstätter, Y.; Tschan, F.; Semmer, N.K.; Spychiger, M.; Breuer, M.; Marsch, S. How Accurate Is Information Transmitted to Medical Professionals Joining a Medical Emergency? A Simulator Study. *Hum. Factors J. Hum. Factors Ergon. Soc.* **2009**, *51*, 115–125. [CrossRef]
99. Crofts, J.F.; Bartlett, C.; Ellis, D.; Winter, C.; Donald, F.; Hunt, L.P.; Draycott, T.J. Patient-actor perception of care: A comparison of obstetric emergency training using manikins and patient-actors. *Qual. Saf. Health Care* **2008**, *17*, 20–24. [CrossRef]
100. Kim, J.; Neilipovitz, D.; Cardinal, P.; Chiu, M.; Clinch, J. A pilot study using high-fidelity simulation to formally evaluate performance in the resuscitation of critically ill patients: The University of Ottawa Critical Care Medicine, High-Fidelity Simulation, and Crisis Resource Management I Study. *Crit. Care Med.* **2006**, *34*, 2167–2174. [CrossRef]
101. Alexander, A.J. A Multiphase Disaster Training Exercise for Emergency Medicine Residents: Opportunity Knocks. *Acad. Emerg. Med.* **2005**, *12*, 404–409. [CrossRef]
102. McLaughlin, S.A.; Doezema, D.; Sklar, D.P. Human Simulation in Emergency Medicine Training: A Model Curriculum. *Acad. Emerg. Med.* **2002**, *9*, 10. [CrossRef]
103. Rozenfeld, R.A.; Nannicelli, A.P.; Brown, A.R.; Eppich, W.J.; Woods, D.M.; Lestrud, S.O.; Noah, Z.L.; Holl, J.L. Verbal Communication During Airway Management and Emergent Endotracheal Intubation: Observations of Team Behavior among Multi-institutional Pediatric Intensive Care Unit In Situ Simulations. *J. Patient Saf.* **2020**, *16*, e114–e119. [CrossRef] [PubMed]

104. Abu-Sultaneh, S.; Whitfill, T.; Rowan, C.M.; Friedman, M.L.; Pearson, K.J.; Berrens, Z.J.; Lutfi, R.; Auerbach, M.A.; Abulebda, K. Improving Simulated Pediatric Airway Management in Community Emergency Departments Using a Collaborative Program With a Pediatric Academic Medical Center. *Respir. Care* **2019**, *64*, 1073–1081. [CrossRef] [PubMed]
105. Leeper, W.R.; Haut, E.R.; Pandian, V.; Nakka, S.; Dodd-O, J.; Bhatti, N.; Hunt, E.A.; Saheed, M.; Dalesio, N.; Schiavi, A.; et al. Multidisciplinary Difficult Airway Course: An Essential Educational Component of a Hospital-Wide Difficult Airway Response Program. *J. Surg. Educ.* **2018**, *75*, 1264–1275. [CrossRef] [PubMed]
106. Lavelle, M.; Attoe, C.; Tritschler, C.; Cross, S. Managing medical emergencies in mental health settings using an interprofessional in-situ simulation training programme: A mixed methods evaluation study. *Nurse Educ. Today* **2017**, *59*, 103–109. [CrossRef]
107. Amiel, I.; Simon, D.; Merin, O.; Ziv, A. Mobile in Situ Simulation as a Tool for Evaluation and Improvement of Trauma Treatment in the Emergency Department. *J. Surg. Educ.* **2016**, *73*, 121–128. [CrossRef]
108. Schmutz, J.; Hoffmann, F.; Heimberg, E.; Manser, T. Effective coordination in medical emergency teams: The moderating role of task type. *Eur. J. Work Organ. Psychol.* **2015**, *24*, 761–776. [CrossRef]
109. Braddock, C.H.; Szaflarski, N.; Forsey, L.; Abel, L.; Hernandez-Boussard, T.; Morton, J. The TRANSFORM Patient Safety Project: A Microsystem Approach to Improving Outcomes on Inpatient Units. *J. Gen. Intern. Med.* **2015**, *30*, 425–433. [CrossRef]
110. Hagiwara, M.A.; Sjöqvist, B.A.; Lundberg, L.; Suserud, B.O.; Henricson, M.; Jonsson, A. Decision support system in prehospital care: A randomized controlled simulation study. *Am. J. Emerg. Med.* **2013**, *31*, 145–153. [CrossRef]
111. Brooks-Buza, H.; Fernandez, R.; Stenger, J.P. The Use of In Situ Simulation to Evaluate Teamwork and System Organization during a Pediatric Dental Clinic Emergency. *Simul. Healthc. J. Soc. Simul. Healthc.* **2011**, *6*, 101–108. [CrossRef]
112. The TOSTI-trial Group; van de Ven, J.; Houterman, S.; Steinweg, R.A.; Scherpbier, A.J.; Wijers, W.; Mol, B.W.J.; Oei, S.G. Reducing errors in health care: Cost-effectiveness of multidisciplinary team training in obstetric emergencies (TOSTI study); a randomised controlled trial. *BMC Pregnancy Childbirth* **2010**, *10*, 59. [CrossRef]
113. Mah, J.W.; Bingham, K.; Dobkin, E.D.; Malchiodi, L.; Russell, A.; Donahue, S.; Staff, I.; Ivy, M.E.; Kirton, O.C. Mannequin Simulation Identifies Common Surgical Intensive Care Unit Teamwork Errors Long after Introduction of Sepsis Guidelines. *Simul. Healthc. J. Soc. Simul. Healthc.* **2009**, *4*, 193–199. [CrossRef] [PubMed]
114. Youngblood, P.; Harter, P.M.; Srivastava, S.; Moffett, S.; Heinrichs, W.L.; Dev, P. Design, Development, and Evaluation of an Online Virtual Emergency Department for Training Trauma Teams. *Simul. Healthc. J. Soc. Simul. Healthc.* **2008**, *3*, 146–153. [CrossRef]
115. Ottestad, E.; Boulet, J.R.; Lighthall, G.K. Evaluating the management of septic shock using patient simulation. *Crit. Care Med.* **2007**, *35*, 769–775. [CrossRef] [PubMed]
116. Drost-de Klerck, A.M.; Olgers, T.J.; van de Meeberg, E.K.; Schonrock-Adema, J.; ter Maaten, J.C. Use of simulation training to teach the ABCDE primary assessment: An observational study in a Dutch University Hospital with a 3–4 months follow-up. *BMJ Open* **2020**, *10*, e032023. [CrossRef] [PubMed]
117. Hultin, M.; Jonsson, K.; Härgestam, M.; Lindkvist, M.; Brulin, C. Reliability of instruments that measure situation awareness, team performance and task performance in a simulation setting with medical students. *BMJ Open* **2019**, *9*, e029412. [CrossRef]
118. Wong, A.H.; Auerbach, M.A.; Ruppel, H.; Crispino, L.J.; Rosenberg, A.; Iennaco, J.D.; Vaca, F.E. Addressing Dual Patient and Staff Safety Through A Team-Based Standardized Patient Simulation for Agitation Management in the Emergency Department. *Simul. Healthc. J. Soc. Simul. Healthc.* **2018**, *13*, 154–162. [CrossRef]
119. Rosenman, E.D.; Dixon, A.J.; Webb, J.M.; Brolliar, S.; Golden, S.J.; Jones, K.A.; Shah, S.; Grand, J.A.; Kozlowski, S.W.J.; Chao, G.T.; et al. A Simulation-based Approach to Measuring Team Situational Awareness in Emergency Medicine: A Multicenter, Observational Study. *Acad. Emerg. Med.* **2018**, *25*, 196–204. [CrossRef]
120. Krage, R.; Zwaan, L.; Tjon Soei Len, L.; Kolenbrander, M.W.; van Groeningen, D.; Loer, S.A.; Wagner, C.; Schober, P. Relationship between non-technical skills and technical performance during cardiopulmonary resuscitation: Does stress have an influence? *Emerg. Med. J.* **2017**, *34*, 728–733. [CrossRef]
121. Smith, H.A.; Reade, M.; Maar, M.; Jeeves, N. Developing a grounded theory for interprofessional collaboration acquisition using facilitator and actor perspectives in simulated wilderness medical emergencies. *Rural Remote Health* **2017**, *17*, 3880. [CrossRef]
122. Munroe, B.; Curtis, K.; Murphy, M.; Strachan, L.; Considine, J.; Hardy, J.; Wilson, M.; Ruperto, K.; Fethney, J.; Buckley, T. A structured framework improves clinical patient assessment and nontechnical skills of early career emergency nurses: A pre-post study using full immersion simulation. *J. Clin. Nurs.* **2016**, *25*, 2262–2274. [CrossRef]
123. Raymond-Dufresne, É.; Brazil, V.; Johnson, P.L.; Nielson, T.L. Pre-clinical medical students' perceptions of their patient safety skills in a simulated emergency department: Patient safety in simulated ED. *Emerg. Med. Australas.* **2016**, *28*, 325–328. [CrossRef] [PubMed]
124. Fernandez Castelao, E.; Boos, M.; Ringer, C.; Eich, C.; Russo, S.G. Effect of CRM team leader training on team performance and leadership behavior in simulated cardiac arrest scenarios: A prospective, randomized, controlled study. *BMC Med. Educ.* **2015**, *15*, 116. [CrossRef] [PubMed]
125. Ozekcin, L.R.; Tuite, P.; Willner, K.; Hravnak, M. Simulation Education: Early Identification of Patient Physiologic Deterioration by Acute Care Nurses. *Clin. Nurse Spec.* **2015**, *29*, 166–173. [CrossRef] [PubMed]
126. Flentje, M.; Schott, M.; Pfützner, A.; Jantzen, J.P. Etablierung eines interprofessionellen simulationsgestützten Kreißsaaltrainings: Ziel: Steigerung der Patientensicherheit. *Notf. Rett.* **2014**, *17*, 379–385. [CrossRef]
127. Melbye, S.; Hotvedt, M.; Bolle, S.R. Mobile videoconferencing for enhanced emergency medical communication—A shot in the dark or a walk in the park?—A simulation study. *Scand. J. Trauma Resusc. Emerg. Med.* **2014**, *22*, 35. [CrossRef]

128. Weller, J.M.; Torrie, J.; Boyd, M.; Frengley, R.; Garden, A.; Ng, W.L.; Frampton, C. Improving team information sharing with a structured call-out in anaesthetic emergencies: A randomized controlled trial. *Br. J. Anaesth.* **2014**, *112*, 1042–1049. [CrossRef]
129. Tavares, W.; LeBlanc, V.R.; Mausz, J.; Sun, V.; Eva, K.W. Simulation-based Assessment of Paramedics and Performance in Real Clinical Contexts. *Prehosp. Emerg. Care* **2014**, *18*, 116–122. [CrossRef]
130. Ziesmann, M.T.; Widder, S.; Park, J.; Kortbeek, J.B.; Brindley, P.; Hameed, M.; Paton-Gay, J.D.; Engels, P.T.; Hicks, C.; Fata, P.; et al. S.T.A.R.T.T.: Development of a national, multidisciplinary trauma crisis resource management curriculum—Results from the pilot course. *J. Trauma Acute Care Surg.* **2013**, *75*, 753–758. [CrossRef]
131. Breuer, G.; Morhart, P. Evidence based simulation training in paediatrics—A bridge in interdisciplinary collaboration. *Anästh. Intensiv.* **2013**, *54*, 430–437.
132. Schumacher, J.; Gray, S.A.; Michel, S.; Alcock, R.; Brinker, A. Respiratory Protection During Simulated Emergency Pediatric Life Support: A Randomized, Controlled, Crossover Study. *Prehospital Disaster Med.* **2013**, *28*, 33–38. [CrossRef]
133. Lajoie, S.P.; Lu, J. Supporting collaboration with technology: Does shared cognition lead to co-regulation in medicine? *Metacognition Learn.* **2012**, *7*, 45–62. [CrossRef]
134. Franc, J.M.; Nichols, D.; Dong, S.L. Increasing Emergency Medicine Residents' Confidence in Disaster Management: Use of an Emergency Department Simulator and an Expedited Curriculum. *Prehospital Disaster Med.* **2012**, *27*, 31–35. [CrossRef] [PubMed]
135. McCoy, C.E.; Menchine, M.; Anderson, C.; Kollen, R.; Langdorf, M.I.; Lotfipour, S. Prospective Randomized Crossover Study of Simulation vs. Didactics for Teaching Medical Students the Assessment and Management of Critically Ill Patients. *J. Emerg. Med.* **2011**, *40*, 448–455. [CrossRef] [PubMed]
136. Cheng, A.; Hunt, E.A.; Donoghue, A.; Nelson, K.; Leflore, J.; Anderson, J.; Eppich, W.; Simon, R.; Rudolph, J.; Nadkarni, V. EXPRESS—Examining Pediatric Resuscitation Education Using Simulation and Scripting: The Birth of an International Pediatric Simulation Research Collaborative—From Concept to Reality. *Simul. Healthc. J. Soc. Simul. Healthc.* **2011**, *6*, 34–41. [CrossRef] [PubMed]
137. Robinson, J.D.; Bray, B.S.; Willson, M.N.; Weeks, D.L. Using Human Patient Simulation to Prepare Student Pharmacists to Manage Medical Emergencies in an Ambulatory Setting. *Am. J. Pharm. Educ.* **2011**, *75*, 3. [CrossRef]
138. Steinmann, D.; Goebel, U.; Schwer, C.I.; Freising, C.; Broß, T.; Strosing, K.M.; Schmutz, A.; Geiger, K.; Heringhaus, C. Lehrveranstaltung Notfallmedizin am Universitätsklinikum Freiburg: Etablierung eines integrativen Gesamtkonzeptes. *Anaesthesist* **2008**, *57*, 1193–1200. [CrossRef]
139. Grant, T.; McNeil, M.A.; Luo, X. Absolute and Relative Value of Patient Simulator Features as Perceived by Medical Undergraduates. *Simul. Healthc. J. Soc. Simul. Healthc.* **2008**, *3*, 133–137. [CrossRef]
140. Gardner, R.; Walzer, T.B.; Simon, R.; Raemer, D.B. Obstetric Simulation as a Risk Control Strategy: Course Design and Evaluation. *Simul. Healthc. J. Soc. Simul. Healthc.* **2008**, *3*, 119–127. [CrossRef]
141. Chen, P.-T.; Cheng, H.-W.; Yen, C.-R.; Yin, I.-W.; Huang, Y.-C.; Wang, C.-C.; Tsou, M.-Y.; Chang, W.-K.; Yien, H.-W.; Kuo, C.-D.; et al. Instructor-based Real-time Multimedia Medical Simulation to Update Concepts of Difficult Airway Management for Experienced Airway Practitioners. *J. Chin. Med. Assoc.* **2008**, *71*, 174–179. [CrossRef]
142. Heinrichs, W.L.; Youngblood, P.; Harter, P.M.; Dev, P. Simulation for Team Training and Assessment: Case Studies of Online Training with Virtual Worlds. *World J. Surg.* **2008**, *32*, 161–170. [CrossRef]
143. Hunt, E.A.; Walker, A.R.; Shaffner, D.H.; Miller, M.R.; Pronovost, P.J. Simulation of In-Hospital Pediatric Medical Emergencies and Cardiopulmonary Arrests: Highlighting the Importance of the First 5 Minutes. *Pediatrics* **2008**, *121*, e34–e43. [CrossRef]
144. Burden, A.; Bekes, C. Simulation-Based Education Improves Quality of Care during Cardiac Arrest Team Responses at an Academic Teaching Hospital: A Case-Control Study. *Yearb. Crit. Care Med.* **2009**, *2009*, 245–246. [CrossRef]
145. Sharara-Chami, R.; Sabouneh, R.; Zeineddine, R.; Banat, R.; Fayad, J.; Lakissian, Z. In Situ Simulation: An Essential Tool for Safe Preparedness for the COVID-19 Pandemic. *Simul. Healthc. J. Soc. Simul. Healthc.* **2020**, *15*, 303–309. [CrossRef] [PubMed]
146. Wallin, C.J.; Meurling, L.; Hedman, L.; Hedegård, J.; Felländer-Tsai, L. Target-focused medical emergency team training using a human patient simulator: Effects on behaviour and attitude. *Med. Educ.* **2007**, *41*, 173–180. [CrossRef] [PubMed]
147. Timmermann, A.; Eich, C.; Russo, S.G.; Barwing, J.; Hirn, A.; Rode, H.; Heuer, J.F.; Heise, D.; Nickel, E.; Klockgether-Radke, A.; et al. Lehre und Simulation: Methoden, Anforderungen, Evaluation und Visionen. *Anaesthesist* **2007**, *56*, 53–62. [CrossRef]
148. Rosenthal, M.E.; Adachi, M.; Ribaudo, V.; Mueck, J.T.; Schneider, R.F.; Mayo, P.H. Achieving Housestaff Competence in Emergency Airway Management Using Scenario Based Simulation Training. *Chest* **2006**, *129*, 1453–1458. [CrossRef]
149. DeVita, M.A. Improving medical emergency team (MET) performance using a novel curriculum and a computerized human patient simulator. *Qual. Saf. Health Care* **2005**, *14*, 326–331. [CrossRef]
150. Mayo, P.H.; Hackney, J.E.; Mueck, J.T.; Ribaudo, V.; Schneider, R.F. Achieving house staff competence in emergency airway management: Results of a teaching program using a computerized patient simulator. *Crit. Care Med.* **2004**, *32*, 2422–2427. [CrossRef]
151. Gundrosen, S.; Andenæs, E.; Aadahl, P.; Thomassen, G. Team talk and team activity in simulated medical emergencies: A discourse analytical approach. *Scand. J. Trauma Resusc. Emerg. Med.* **2016**, *24*, 135. [CrossRef]
152. Weller, J.M. Simulation in undergraduate medical education: Bridging the gap between theory and practice. *Med. Educ.* **2004**, *38*, 32–38. [CrossRef]

153. Chandramani, A.; Dussault, N.; Parameswaran, R.; Rodriguez, J.; Novack, J.; Ahn, J.; Oyola, S.; Carter, K. A Needs Assessment and Educational Intervention Addressing the Care of Sexual Assault Patients in the Emergency Department. *J. Forensic. Nurs.* **2020**, *16*, 73–82. [CrossRef] [PubMed]
154. Bachman, M.W.; Anzalone, B.C.; Williams, J.G.; DeLuca, M.B.; Garner, D.G.; Preddy, J.E.; Cabanas, J.G.; Myers, J.B. Evaluation of an Integrated Rescue Task Force Model for Active Threat Response. *Prehosp. Emerg. Care* **2019**, *23*, 309–318. [CrossRef] [PubMed]
155. Mehta, N.; Boynton, C.; Boss, L.; Morris, H.; Tatla, T. Multidisciplinary difficult airway simulation training: Two year evaluation and validation of a novel training approach at a District General Hospital based in the UK. *Eur. Arch. Otorhinolaryngol.* **2013**, *270*, 211–217. [CrossRef] [PubMed]
156. Minehart, R.D.; Pian-Smith, M.C.M.; Walzer, T.B.; Gardner, R.; Rudolph, J.W.; Simon, R.; Raemer, D.B. Speaking Across the Drapes: Communication Strategies of Anesthesiologists and Obstetricians during a Simulated Maternal Crisis. *Simul. Healthc. J. Soc. Simul. Healthc.* **2012**, *7*, 166–170. [CrossRef]
157. Ruesseler, M.; Weinlich, M.; Müller, M.P.; Byhahn, C.; Marzi, I.; Walcher, F. Published: Simulation training improves ability to manage medical emergencies. *Postgrad. Med. J.* **2012**, *88*, 312–316. [CrossRef]
158. Harvey, A.; Nathens, A.B.; Bandiera, G.; LeBlanc, V.R. Threat and challenge: Cognitive appraisal and stress responses in simulated trauma resuscitations: Appraisal and stress in simulated trauma resuscitations. *Med. Educ.* **2010**, *44*, 587–594. [CrossRef]
159. Høyer, C.B.; Christensen, E.F.; Eika, B. Junior physician skill and behaviour in resuscitation: A simulation study. *Resuscitation* **2009**, *80*, 244–248. [CrossRef]
160. Farah, R.; Stiner, E.; Zohar, Z.; Zveibil, F.; Eisenman, A. Cardiopulmonary resuscitation surprise drills for assessing, improving and maintaining cardiopulmonary resuscitation skills of hospital personnel. *Eur. J. Emerg. Med.* **2007**, *14*, 332–336. [CrossRef]
161. Birch, L.; Jones, N.; Doyle, P.M.; Green, P.; McLaughlin, A.; Champney, C.; Williams, D.; Gibbon, K.; Taylor, K. Obstetric skills drills: Evaluation of teaching methods. *Nurse Educ. Today* **2007**, *27*, 915–922. [CrossRef]
162. Riley, R.H.; Grauze, A.M.; Trewhella, N.H.; Chinnery, C.; Horley, R.A. Three years of 'CASMS': The world's busiest medical simulation centre. *Med. J. Aust.* **2003**, *179*, 626–630. [CrossRef]
163. Andersen, B.R.; Hinrich, J.L.; Rasmussen, M.B.; Lehmann, S.; Ringsted, C.; Løkkegaard, E.; Tolsgaard, M.G. Social ties between team members affect patient satisfaction: A data-driven approach to handling complex network analyses. *Adv. Health Sci. Educ.* **2020**, *25*, 581–606. [CrossRef] [PubMed]
164. Habib, H.; Ginanjar, E.; Mansjoer, A.; Sulistio, S.; Albar, I.A.; Mulyana, R.M. ST-Elevation Myocardial Infarction: A Simulation Case for Evaluation of Interprofessional Performance in a Hospital. *Emerg. Med. Int.* **2019**, *2019*, 1–4. [CrossRef] [PubMed]
165. Truta, T.S.; Boeriu, C.M.; Copotoiu, S.-M.; Petrisor, M.; Turucz, E.; Vatau, D.; Lazarovici, M. Improving nontechnical skills of an interprofessional emergency medical team through a one day crisis resource management training. *Medicine* **2018**, *97*, e11828. [CrossRef] [PubMed]
166. Nadkarni, L.D.; Roskind, C.G.; Auerbach, M.A.; Calhoun, A.W.; Adler, M.D.; Kessler, D.O. The Development and Validation of a Concise Instrument for Formative Assessment of Team Leader Performance during Simulated Pediatric Resuscitations. *Simul. Healthc. J. Soc. Simul. Healthc.* **2018**, *13*, 77–82. [CrossRef]
167. Bittle, M.; O'Rourke, K.; Srinivas, S.K. Interdisciplinary Skills Review Program to Improve Team Responses during Postpartum Hemorrhage. *J. Obstet. Gynecol. Neonatal Nurs. JOGNN* **2018**, *47*, 254–263. [CrossRef]
168. Everett, T.C.; Morgan, P.J.; Brydges, R.; Kurrek, M.; Tregunno, D.; Cunningham, L.; Chan, A.; Forde, D.; Tarshis, J. The impact of critical event checklists on medical management and teamwork during simulated crises in a surgical daycare facility. *Anaesthesia* **2017**, *72*, 350–358. [CrossRef]
169. Brandstorp, H.; Halvorsen, P.A.; Sterud, B.; Haugland, B.; Kirkengen, A.L. Primary care emergency team training in situ means learning in real context. *Scand. J. Prim. Health Care* **2016**, *34*, 295–303. [CrossRef]
170. Brown, C.W.; Howard, M.; Morse, J. The use of trauma interprofessional simulated education (TIPSE) to enhance role awareness in the emergency department setting. *J. Interprof. Care* **2016**, *30*, 388–390. [CrossRef]
171. Wheeler, D.S.; Geis, G.; Mack, E.H.; LeMaster, T.; Patterson, M.D. High-reliability emergency response teams in the hospital: Improving quality and safety using in situ simulation training. *BMJ Qual. Saf.* **2013**, *22*, 507–514. [CrossRef]
172. Miller, D.; Crandall, C.; Washington, C.; McLaughlin, S. Improving Teamwork and Communication in Trauma Care through In Situ Simulations: Improving teamwork and communication with in situ simulations. *Acad. Emerg. Med.* **2012**, *19*, 608–612. [CrossRef]
173. Öchsner, W.; Josse, F.; Fleischmann, S.; Huber-Lang, M.; Helm, M. Gelernt ist gelernt? *Notarzt* **2016**, *32*, 109–116. [CrossRef]
174. McCarthy, D.M.; Powell, R.E.; Cameron, K.A.; Salzman, D.H.; Papanagnou, D.; Doty, A.M.; Leiby, B.E.; Piserchia, K.; Klein, M.R.; Zhang, X.C.; et al. Simulation-based mastery learning compared to standard education for discussing diagnostic uncertainty with patients in the emergency department: A randomized controlled trial. *BMC Med. Educ.* **2020**, *20*, 49. [CrossRef] [PubMed]
175. Endacott, R.; Bogossian, F.E.; Cooper, S.J.; Forbes, H.; Kain, V.J.; Young, S.C.; Porter, J.E.; the First2Act Team. Leadership and teamwork in medical emergencies: Performance of nursing students and registered nurses in simulated patient scenarios. *J. Clin. Nurs.* **2015**, *24*, 90–100. [CrossRef] [PubMed]
176. Abir, M.; Davis, M.M.; Sankar, P.; Wong, A.C.; Wang, S.C. Design of a Model to Predict Surge Capacity Bottlenecks for Burn Mass Casualties at a Large Academic Medical Center. *Prehospital Disaster Med.* **2013**, *28*, 23–32. [CrossRef]
177. Krange, I.; Moen, A.; Ludvigsen, S. Computer-based 3D simulation: A study of communication practices in a trauma team performing patient examination and diagnostic work. *Instr. Sci.* **2012**, *40*, 829–847. [CrossRef]

178. Rauner, M.S.; Schaffhauser-Linzatti, M.M.; Niessner, H. Resource planning for ambulance services in mass casualty incidents: A DES-based policy model. *Health Care Manag. Sci.* **2012**, *15*, 254–269. [CrossRef]
179. Hoard, M.; Homer, J.; Manley, W.; Furbee, P.; Haque, A.; Helmkamp, J. Systems modeling in support of evidence-based disaster planning for rural areas. *Int. J. Hyg. Environ. Health* **2005**, *208*, 117–125. [CrossRef]
180. Stahl, J.E.; Roberts, M.S.; Gazelle, S. Optimizing management and financial performance of the teaching ambulatory care clinic. *J. Gen. Intern. Med.* **2003**, *18*, 266–274. [CrossRef]
181. Hawkins, R.; MacKrell Gaglione, M.; LaDuca, T.; Leung, C.; Sample, L.; Gliva-McConvey, G.; Liston, W.; De Champlain, A.; Ciccone, A. Assessment of patient management skills and clinical skills of practising doctors using computer-based case simulations and standardised patients. *Med. Educ.* **2004**, *38*, 958–968. [CrossRef]
182. Wai, A.K.; Lam, V.S.; Ng, Z.L.; Pang, M.T.; Tsang, V.W.; Lee, J.J.; Wong, J. Exploring the role of simulation to foster interprofessional teamwork among medical and nursing students: A mixed-method pilot investigation in Hong Kong. *J. Interprof. Care* **2021**, *35*, 890–898. [CrossRef]
183. Morreel, S.; Colliers, A.; Remmen, R.; Verhoeven, V.; Philips, H. How accurate is telephone triage in out-of-hours care? An observational trial in real patients. *Acta Clin. Belg.* **2022**, *77*, 301–306. [CrossRef]
184. Wenlock, R.D.; Arnold, A.; Patel, H.; Kirtchuk, D. Low-fidelity simulation of medical emergency and cardiac arrest responses in a suspected COVID-19 patient—An interim report. *Clin. Med.* **2020**, *20*, e66–e71. [CrossRef]
185. Servotte, J.-C.; Bragard, I.; Szyld, D.; Van Ngoc, P.; Scholtes, B.; Van Cauwenberge, I.; Dardenne, N.; Goosse, M.; Pilote, B.; Guillaume, M.; et al. Efficacy of a Short Role-Play Training on Breaking Bad News in the Emergency Department. *West. J. Emerg. Med.* **2019**, *20*, 893–902. [CrossRef]
186. Kumar, A.; Singh, T.; Bansal, U.; Singh, J.; Davie, S.; Malhotra, A. Mobile obstetric and neonatal simulation based skills training in India. *Midwifery* **2019**, *72*, 14–22. [CrossRef]
187. Torlén, K.; Kurland, L.; Castrén, M.; Olanders, K.; Bohm, K. A comparison of two emergency medical dispatch protocols with respect to accuracy. *Scand. J. Trauma Resusc. Emerg. Med.* **2017**, *25*, 122. [CrossRef]
188. Ginsburg, L.; Bain, L. The evaluation of a multifaceted intervention to promote 'speaking up' and strengthen interprofessional teamwork climate perceptions. *J. Interprof. Care* **2017**, *31*, 207–217. [CrossRef]
189. Rybing, J.; Nilsson, H.; Jonson, C.O.; Bang, M. Studying distributed cognition of simulation-based team training with DiCoT. *Ergonomics* **2016**, *59*, 423–434. [CrossRef]
190. Lennquist Montán, K.; Hreckovski, B.; Dobson, B.; Örtenwall, P.; Montán, C.; Khorram-Manesh, A.; Lennquist, S. Development and evaluation of a new simulation model for interactive training of the medical response to major incidents and disasters. *Eur. J. Trauma Emerg. Surg.* **2014**, *40*, 429–443. [CrossRef]
191. Meier, A.H.; Boehler, M.L.; McDowell, C.M.; Schwind, C.; Markwell, S.; Roberts, N.K.; Sanfey, H. A Surgical Simulation Curriculum for Senior Medical Students Based on TeamSTEPPS. *Arch. Surg.* **2012**, *147*, 761. [CrossRef]
192. Von Wyl, T.; Zuercher, M.; Amsler, F.; Walter, B.; Ummenhofer, W. Technical and non-technical skills can be reliably assessed during paramedic simulation training: Skill assessment of EMS providers. *Acta Anaesthesiol. Scand.* **2009**, *53*, 121–127. [CrossRef]
193. Noeller, T.P.; Smith, M.D.; Holmes, L.; Cappaert, M.; Gross, A.J.; Cole-Kelly, K.; Rosen, K.R. A Theme-based Hybrid Simulation Model to Train and Evaluate Emergency Medicine Residents. *Acad. Emerg. Med.* **2008**, *15*, 1199–1206. [CrossRef]
194. Chi, C.-H.; Chao, W.-H.; Chuang, C.-C.; Tsai, M.-C.; Tsai, L.-M. Emergency medical technicians' disaster training by tabletop exercise. *Am. J. Emerg. Med.* **2001**, *19*, 433–436. [CrossRef]
195. Coggins, A.; Santos, A.D.L.; Zaklama, R.; Murphy, M. Interdisciplinary clinical debriefing in the emergency department: An observational study of learning topics and outcomes. *BMC Emerg. Med.* **2020**, *20*, 79. [CrossRef]
196. Chałupnik, M.; Atkins, S. 'Everyone happy with what their role is?': A pragmalinguistic evaluation of leadership practices in emergency medicine training. *J. Pragmat.* **2020**, *160*, 80–96. [CrossRef]
197. Diaz, M.C.G.; Dawson, K. Impact of Simulation-Based Closed-Loop Communication Training on Medical Errors in a Pediatric Emergency Department. *Am. J. Med. Qual.* **2020**, *35*, 474–478. [CrossRef]
198. Porter, A.L.; Ebot, J.; Lane, K.; Mooney, L.H.; Lannen, A.M.; Richie, E.M.; Dlugash, R.; Mayo, S.; Brott, T.G.; Ziai, W.; et al. Enhancing the Informed Consent Process Using Shared Decision Making and Consent Refusal Data from the CLEAR III Trial. *Neurocrit. Care* **2020**, *32*, 340–347. [CrossRef]
199. Leikin, J.B. The future of population medicine: Investigating the role of advanced practice providers and simulation education in special patient populations. *Dis. Mon.* **2019**, *65*, 220. [CrossRef]
200. Murphy, M.; McCloughen, A.; Curtis, K. The impact of simulated multidisciplinary Trauma Team Training on team performance: A qualitative study. *Australas. Emerg. Care* **2019**, *22*, 1–7. [CrossRef]
201. Jeffers, J.M.; Poling, S. The development and implementation of a 12-month simulation-based learning curriculum for pediatric emergency medicine fellows utilizing debriefing with good judgment and rapid cycle deliberate practice. *BMC Med. Educ.* **2019**, *19*, 22. [CrossRef]
202. Marker, S.; Mohr, M.; Østergaard, D. Simulation-based training of junior doctors in handling critically ill patients facilitates the transition to clinical practice: An interview study. *BMC Med. Educ.* **2019**, *19*, 11. [CrossRef]
203. Rasmussen, K.; Langdalen, H.; Sollid, S.J.M.; Abrahamsen, E.B.; Sørskår, L.I.K.; Bondevik, G.T.; Abrahamsen, H.B. Training and assessment of non-technical skills in Norwegian helicopter emergency services: A cross-sectional and longitudinal study. *Scand. J. Trauma Resusc. Emerg. Med.* **2019**, *27*, 1. [CrossRef]

204. Nadir, N.-A.; Hart, D.; Cassara, M.; Noelker, J.; Moadel, T.; Kulkarni, M.; Sampson, C.; Bentley, S.; Kaik, N.; Hernandez, J. Simulation-based Remediation in Emergency Medicine Residency Training: A Consensus Study. *West. J. Emerg. Med.* **2018**, *20*, 145–156. [CrossRef] [PubMed]
205. Sochet, A.A.; Ryan, K.S.; Bartlett, J.L.; Nakagawa, T.A.; Bingham, L. Standardization of Pediatric Interfacility Transport Handover: Measuring the Development of a Shared Mental Model. *Pediatr. Crit. Care Med.* **2018**, *19*, e72–e79. [CrossRef]
206. Eppich, W.J.; Rethans, J.-J.; Dornan, T.; Teunissen, P.W. Learning how to learn using simulation: Unpacking disguised feedback using a qualitative analysis of doctors' telephone talk. *Med. Teach.* **2018**, *40*, 661–667. [CrossRef]
207. Russell, E.; Hall, A.K.; Hagel, C.; Petrosoniak, A.; Dagnone, J.D.; Howes, D. Simulation in Canadian postgraduate emergency medicine training—A national survey. *Can. J. Emerg. Med.* **2018**, *20*, 132–141. [CrossRef] [PubMed]
208. Reime, M.H.; Johnsgaard, T.; Kvam, F.I.; Aarflot, M.; Engeberg, J.M.; Breivik, M.; Brattebø, G. Learning by viewing versus learning by doing: A comparative study of observer and participant experiences during an interprofessional simulation training. *J. Interprof. Care* **2017**, *31*, 51–58. [CrossRef]
209. Gordon, C.J.; Jorm, C.; Shulruf, B.; Weller, J.; Currie, J.; Lim, R.; Osomanski, A. Development of a self-assessment teamwork tool for use by medical and nursing students. *BMC Med. Educ.* **2016**, *16*, 218. [CrossRef] [PubMed]
210. Tsai, A.C.; Krisciunas, G.P.; Brook, C.; Basa, K.; Gonzalez, M.; Crimlisk, J.; Silva, J.; Grillone, G.A. Comprehensive Emergency Airway Response Team (EART) Training and Education: Impact on Team Effectiveness, Personnel Confidence, and Protocol Knowledge. *Ann. Otol. Rhinol. Laryngol.* **2016**, *125*, 457–463. [CrossRef]
211. Dávila-Torres, J.; González-Izquierdo, J.d.J.; Ruíz-Rosas, R.A.; Cruz-Cruz, P.d.R.; Hernández-Valencia, M. Equipo de Respuesta Inmediata obstétrico en el Instituto Mexicano del Seguro Social, factores facilitadores. *Cirugía Cir.* **2015**, *83*, 492–495. [CrossRef]
212. Kellicut, D.C.; Kuncir, E.; Williamson, H.M.; Nielsen, P.E. Surgical Team Assessment Training (STAT): Improving surgical teams during deployment. *J. Am. Coll. Surg.* **2012**, *215*, S100. [CrossRef]
213. Clarke, S.; Lyon, R.M.; Short, S.; Crookston, C.; Clegg, G.R. A specialist, second-tier response to out-of-hospital cardiac arrest: Setting up TOPCAT2: Table 1. *Emerg. Med. J.* **2014**, *31*, 405–407. [CrossRef] [PubMed]
214. Kilianski, A.; O'Rourke, A.T.; Carlson, C.L.; Parikh, S.M.; Shipman-Amuwo, F. The Planning, Execution, and Evaluation of a Mass Prophylaxis Full-Scale Exercise in Cook County, IL. *Biosecur. Bioterror. Biodef. Strategy Pract. Sci.* **2014**, *12*, 106–116. [CrossRef] [PubMed]
215. Yonekawa, C.; Suzukawa, M.; Yamashita, K.; Kubota, K.; Yasuda, Y.; Kobayashi, A.; Matsubara, H.; Toyokuni, Y. Development of a first-responder dispatch system using a smartphone. *J. Telemed. Telecare* **2014**, *20*, 75–81. [CrossRef] [PubMed]
216. Szulewski, A.; Howes, D. Combining First-Person Video and Gaze-Tracking in Medical Simulation: A Technical Feasibility Study. *Sci. World J.* **2014**, *2014*, 1–4. [CrossRef]
217. van der Nelson, H.A.; Siassakos, D.; Bennett, J.; Godfrey, M.; Spray, L.; Draycott, T.; Donald, F. Multiprofessional Team Simulation Training, Based on an Obstetric Model, Can Improve Teamwork in Other Areas of Health Care. *Am. J. Med. Qual.* **2014**, *29*, 78–82. [CrossRef]
218. Hoedtke, J.; Thomas, P.; Heinzmann, S.; Coley, M.; Wirtz, S. TraumaManagement®: Kurskonzept zum interdisziplinären und interprofessionellen Training einer leitliniengerechten präklinischen Polytraumaversorgung. *Notf. Rett.* **2013**, *16*, 210–215. [CrossRef]
219. Vyas, R.M.; Eberlin, K.R.; Hamdan, U.S. Implementation of an Emergency Response Protocol for Overseas Surgical Outreach Initiatives. *Plast. Reconstr. Surg.* **2013**, *131*, 631e–636e. [CrossRef]
220. Bristowe, K.; Siassakos, D.; Hambly, H.; Angouri, J.; Yelland, A.; Draycott, T.J.; Fox, R. Teamwork for clinical emergencies: Interprofessional focus group analysis and triangulation with simulation. *Qual. Health Res.* **2012**, *22*, 1383–1394. [CrossRef]
221. Dasgupta, S.; French, S.; Williams-Johnson, J.; Hutson, R.; Hart, N.; Wong, M.; Williams, E.; Espinosa, K.; Maycock, C.; Edwards, R. EMS Response to an Airliner Crash. *Prehospital Disaster Med.* **2012**, *27*, 299–302. [CrossRef]
222. Schneiders, M.-T.; Herbst, S.; Schilberg, D.; Isenhardt, I.; Jeschke, S.; Fischermann, H.; Bergrath, S.; Rossaint, R.; Skorning, M. Telenotarzt auf dem Prüfstand: Evaluation des Projekts Med-on-@ix aus Sicht der Rettungsassistenten. *Notf. Rett.* **2012**, *15*, 410–415. [CrossRef]
223. Jokela, J.; Rådestad, M.; Gryth, D.; Nilsson, H.; Rüter, A.; Svensson, L.; Harkke, V.; Luoto, M.; Castrén, M. Increased Situation Awareness in Major Incidents—Radio Frequency Identification (RFID) Technique: A Promising Tool. *Prehospital Disaster Med.* **2012**, *27*, 81–87. [CrossRef] [PubMed]
224. Wagner, B.; Meirowitz, N.; Shah, J.; Nanda, D.; Reggio, L.; Cohen, P.; Britt, K.; Kaufman, L.; Walia, R.; Bacote, C.; et al. Comprehensive Perinatal Safety Initiative to Reduce Adverse Obstetric Events. *J. Healthc. Qual.* **2012**, *34*, 6–15. [CrossRef] [PubMed]
225. Siassakos, D.; Bristowe, K.; Hambly, H.; Angouri, J.; Crofts, J.F.; Winter, C.; Hunt, L.P.; Draycott, T.J. Team Communication With Patient Actors: Findings From a Multisite Simulation Study. *Simul. Healthc. J. Soc. Simul. Healthc.* **2011**, *6*, 143–149. [CrossRef] [PubMed]
226. Waßmer, R.; Zimmer, M.; Oberndörfer, D.; Wilken, V.; Ackermann, H.; Breitkreutz, R. Kann durch eine einfache Schulung das Kommunikations- und Patientenübergabemanagement in der Notfallmedizin verbessert werden? *Notf. Rett.* **2011**, *14*, 37–44. [CrossRef]
227. Robertson, B.; Kaplan, B.; Atallah, H.; Higgins, M.; Lewitt, M.J.; Ander, D.S. The Use of Simulation and a Modified TeamSTEPPS Curriculum for Medical and Nursing Student Team Training. *Simul. Healthc. J. Soc. Simul. Healthc.* **2010**, *5*, 332–337. [CrossRef]

228. Jordi Ritz, E.-M.; Eich, C.; Gisin, S.; Heinzel, O.; Hüpfl, M.; Erb, T.O. Kindersimulation heute und morgen: Perspektiven und Konzepte. *Anaesthesist* **2009**, *58*, 1231–1238. [CrossRef]
229. Heinzel, O.; Schwindt, J.C.; Eppich, W. Das ABC des lebensbedrohlichen Kindernotfalls. *Monatsschr. Kinderheilkd.* **2009**, *157*, 801–816. [CrossRef]
230. Pian-Smith, M.C.M.; Simon, R.; Minehart, R.D.; Podraza, M.; Rudolph, J.; Walzer, T.; Raemer, D. Teaching Residents the Two-Challenge Rule: A Simulation-Based Approach to Improve Education and Patient Safety. *Simul. Healthc. J. Soc. Simul. Healthc.* **2009**, *4*, 84–91. [CrossRef]
231. Dieckmann, P.; Molin Friis, S.; Lippert, A.; Østergaard, D. The art and science of debriefing in simulation: Ideal and practice. *Med. Teach.* **2009**, *31*, e287–e294. [CrossRef]
232. Schlechtriemen, T. Qualitätsmanagement in der Luftrettung. *Notf. Rett.* **2008**, *11*, 246–251. [CrossRef]
233. Steadman, R.H.; Coates, W.C.; Huang, Y.M.; Matevosian, R.; Larmon, B.R.; McCullough, L.; Ariel, D. Simulation-based training is superior to problem-based learning for the acquisition of critical assessment and management skills. *Crit. Care Med.* **2006**, *34*, 151–157. [CrossRef] [PubMed]
234. Lee Gordon, D.; Issenberg, S.B.; Gordon, M.S.; LaCombe, D.; McGaghie, W.C.; Petrusa, E.R. Stroke training of prehospital providers: An example of simulation-enhanced blended learning and evaluation. *Med. Teach.* **2005**, *27*, 114–121. [CrossRef] [PubMed]
235. Issleib, M.; Zöllner, C. Simulationsbasiertes Training—Für den Notfall vorbereitet sein in Anästhesie und Notfallmedizin: Auf dem Weg zu neuen Standards der Ausbildung in Deutschland. *Bundesgesundheitsblatt Gesundh. Gesundh.* **2015**, *58*, 67–73. [CrossRef] [PubMed]
236. Beauchamp, G.A.; McGregor, A.J.; Choo, E.K.; Safdar, B.; Rayl Greenberg, M. Incorporating Sex and Gender into Culturally Competent Simulation in Medical Education. *J. Womens Health* **2019**, *28*, 1762–1767. [CrossRef]
237. Coggins, A.; Zaklama, R.; Szabo, R.A.; Diaz-Navarro, C.; Scalese, R.J.; Krogh, K.; Eppich, W. Twelve tips for facilitating and implementing clinical debriefing programmes. *Med. Teach.* **2021**, *43*, 509–517. [CrossRef]
238. Speer, T.; Mühlbradt, T.; Fastner, C.; Schöffski, O.; Schröder, S. Simulationstraining als Teil des klinischen Risikomanagements: Eine gesundheitsökonomische Betrachtung. *Anaesthesist* **2019**, *68*, 161–170. [CrossRef]
239. Satin, A.J. Simulation in Obstetrics. *Obstet. Gynecol.* **2018**, *132*, 199–209. [CrossRef]
240. Asche, C.V.; Kim, M.; Brown, A.; Golden, A.; Laack, T.A.; Rosario, J.; Strother, C.; Totten, V.Y.; Okuda, Y. Communicating Value in Simulation: Cost-Benefit Analysis and Return on Investment. *Acad. Emerg. Med.* **2018**, *25*, 230–237. [CrossRef]
241. Cheng, A.; Mikrogianakis, A. Rapid response systems for paediatrics: Suggestions for optimal organization and training. *Paediatr. Child Health* **2018**, *23*, 51–57. [CrossRef]
242. Gal, J.; der Dgina, V.; Gotthardt, P.; der DGSiM, V. Klinische Notfallmedizin—Implementierung der Simulation in die Weiterbildung: Gemeinsames Positionspapier der DGINA und der DGSiM. *Notf. Rett.* **2016**, *19*, 491–495. [CrossRef]
243. Jnah, A.J.; Newberry, D.M.; Trembath, A.N.; Robertson, T.; Downing, A.; Greene, M.; Sewell, K. Neonatal Resuscitation Training: Implications of Course Construct and Discipline Compartmentalization on Role Confusion and Role Ambiguity. *Adv. Neonatal Care* **2016**, *16*, 201–210. [CrossRef] [PubMed]
244. Legendre, G.; Bouet, P.-E.; Sentilhes, L. Place de la simulation pour réduire la morbidité néonatale et maternelle secondaire à une dystocie des épaules. *J. Gynécologie Obstétrique Biol. Reprod.* **2015**, *44*, 1285–1293. [CrossRef] [PubMed]
245. Bank, I.; Cheng, A.; McLeod, P.; Bhanji, F. Determining content for a simulation-based curriculum in pediatric emergency medicine: Results from a national Delphi process. *Can. J. Emerg. Med.* **2015**, *17*, 662–669. [CrossRef] [PubMed]
246. Doughty, C.B.; Kessler, D.O.; Zuckerbraun, N.S.; Stone, K.P.; Reid, J.R.; Kennedy, C.S.; Nypaver, M.M.; Auerbach, M.A. Simulation in Pediatric Emergency Medicine Fellowships. *Pediatrics* **2015**, *136*, e152–e158. [CrossRef]
247. Gräff, I.; Lenkeit, S. Innerklinische Akutversorgung von Notfallpatienten: Stellenwert und Aspekte der interprofessionellen Teamarbeit. *Med. Klin. Intensivmed. Notf.* **2014**, *109*, 479–484. [CrossRef] [PubMed]
248. Markenson, D.; Woolf, S.; Redlener, I.; Reilly, M. Disaster Medicine and Public Health Preparedness of Health Professions Students: A Multidisciplinary Assessment of Knowledge, Confidence, and Attitudes. *Disaster Med. Public Health Prep.* **2013**, *7*, 499–506. [CrossRef]
249. Rall, M.; Oberfrank, S. „Human factors“ und „crisis resource management“: Erhöhung der Patientensicherheit. *Unfallchirurg* **2013**, *116*, 892–899. [CrossRef]
250. Trentzsch, H.; Urban, B.; Sandmeyer, B.; Hammer, T.; Strohm, P.C.; Lazarovici, M. Verbessern simulatorbasierte Teamtrainings die Patientensicherheit? *Unfallchirurg* **2013**, *116*, 900–908. [CrossRef]
251. Eppich, W.J.; Nypaver, M.M.; Mahajan, P.; Denmark, K.T.; Kennedy, C.; Joseph, M.M.; Kim, I. The Role of High-Fidelity Simulation in Training Pediatric Emergency Medicine Fellows in the United States and Canada. *Pediatr. Emerg. Care* **2013**, *29*, 1–7. [CrossRef]
252. Motola, I.; Devine, L.A.; Chung, H.S.; Sullivan, J.E.; Issenberg, S.B. Simulation in healthcare education: A best evidence practical guide. AMEE Guide No. 82. *Med. Teach.* **2013**, *35*, e1511–e1530. [CrossRef]
253. Doumouras, A.G.; Keshet, I.; Nathens, A.B.; Ahmed, N.; Hicks, C.M. A Crisis of Faith? A Review of Simulation in Teaching Team-Based, Crisis Management Skills to Surgical Trainees. *J. Surg. Educ.* **2012**, *69*, 274–281. [CrossRef]
254. Pothiawala, S.; Lateef, F. Simulation Training in Emergency Medicine (STEM): An Integral Component of Residency Curriculum. *Hong Kong J. Emerg. Med.* **2012**, *19*, 41–45. [CrossRef]

255. Issenberg, S.B.; Chung, H.S.; Devine, L.A. Patient Safety Training Simulations Based on Competency Criteria of the Accreditation Council for Graduate Medical Education. *Mt. Sinai J. Med. J. Transl. Pers. Med.* **2011**, *78*, 842–853. [CrossRef] [PubMed]
256. Thomassen, Ø.; Espeland, A.; Søfteland, E.; Lossius, H.M.; Heltne, J.K.; Brattebø, G. Implementation of checklists in health care; learning from high-reliability organisations. *Scand. J. Trauma Resusc. Emerg. Med.* **2011**, *19*, 53. [CrossRef] [PubMed]
257. Tews, M.C.; Hamilton, G.C. Integrating Emergency Medicine Principles and Experience Throughout the Medical School Curriculum: Why and How: Em in the medical school curriculum. *Acad. Emerg. Med.* **2011**, *18*, 1072–1080. [CrossRef] [PubMed]
258. d'Agincourt-Canning, L.G.; Kissoon, N.; Singal, M.; Pitfield, A.F. Culture, Communication and Safety: Lessons from the Airline Industry. *Indian J. Pediatr.* **2011**, *78*, 703–708. [CrossRef] [PubMed]
259. Heinzel, O.; Eppich, W.J.; Schwindt, J.C.; Hoffmann, F. Der lebensbedrohliche Kindernotfall im Notarztdienst. *Notf. Rett.* **2011**, *14*, 151–166. [CrossRef]
260. Magrabi, F.; Li, S.Y.W.; Dunn, A.G.; Coeira, E. Challenges in Measuring the Impact of Interruption on Patient Safety and Workflow Outcomes. *Methods Inf. Med.* **2011**, *50*, 447–453. [CrossRef]
261. Deutsch, E.S.; Olivieri, J.J.; Hossain, J.; Sobolewski, H.L. Medical Simulation Topic Interests in a Pediatric Healthcare System. *Simul. Healthc. J. Soc. Simul. Healthc.* **2010**, *5*, 289–294. [CrossRef]
262. Heitz, C.R.; Coates, W.; Farrell, S.E.; Fisher, J.; Juve, A.M.; Yarris, L.M. Critical Appraisal of Emergency Medicine Educational Research: The Best Publications of 2015. *Acad. Emerg. Med.* **2017**, *24*, 1212–1225. [CrossRef]
263. Eisen, L.A.; Savel, R.H. What Went Right. *Chest* **2009**, *136*, 910–917. [CrossRef] [PubMed]
264. Lackner, C.K.; Burghofer, K.; Baschnegger, H.; Rall, M.; Zwissler, B. Simulationstraining in der Akut- und Notfallmedizin. *Notf. Rett.* **2009**, *12*, 366–371. [CrossRef]
265. Lerner, S.; Magrane, D.; Friedman, E. Teaching Teamwork in Medical Education: Teaching teamwork in medical education. *Mt. Sinai J. Med. J. Transl. Pers. Med.* **2009**, *76*, 318–329. [CrossRef] [PubMed]
266. Fernandez, R.; Vozenilek, J.A.; Hegarty, C.B.; Motola, I.; Reznek, M.; Phrampus, P.E.; Kozlowski, S.W.J. Developing Expert Medical Teams: Toward an Evidence-based Approach. *Acad. Emerg. Med.* **2008**, *15*, 1025–1036. [CrossRef] [PubMed]
267. Fernandez, R.; Kozlowski, S.W.J.; Shapiro, M.J.; Salas, E. Toward a Definition of Teamwork in Emergency Medicine. *Acad. Emerg. Med.* **2008**, *15*, 1104–1112. [CrossRef]
268. Hicks, C.M.; Bandiera, G.W.; Denny, C.J. Building a Simulation-based Crisis Resource Management Course for Emergency Medicine, Phase 1: Results from an Interdisciplinary Needs Assessment Survey. *Acad. Emerg. Med.* **2008**, *15*, 1136–1143. [CrossRef]
269. Kaji, A.H.; Bair, A.; Okuda, Y.; Kobayashi, L.; Khare, R.; Vozenilek, J. Defining Systems Expertise: Effective Simulation at the Organizational Level-Implications for Patient Safety, Disaster Surge Capacity, and Facilitating the Systems Interface. *Acad. Emerg. Med.* **2008**, *15*, 1098–1103. [CrossRef]
270. McLaughlin, S.; Fitch, M.T.; Goyal, D.G.; Hayden, E.; Kauh, C.Y.; Laack, T.A.; Nowicki, T.; Okuda, Y.; Palm, K.; Pozner, C.N.; et al. Simulation in Graduate Medical Education 2008: A Review for Emergency Medicine. *Acad. Emerg. Med.* **2008**, *15*, 1117–1129. [CrossRef]
271. Spillane, L.; Hayden, E.; Fernandez, R.; Adler, M.; Beeson, M.; Goyal, D.; Smith-Coggins, R.; Boulet, J. The Assessment of Individual Cognitive Expertise and Clinical Competency: A Research Agenda. *Acad. Emerg. Med.* **2008**, *15*, 1071–1078. [CrossRef]
272. Guise, J.-M.; Segel, S. Teamwork in obstetric critical care. *Best Pract. Res. Clin. Obstet. Gynaecol.* **2008**, *22*, 937–951. [CrossRef]
273. Turnwald, G.; Stone, E.; Bristol, D.; Fuentealba, C.; Hardie, L.; Hellyer, P.; Jaeger, L.; Kerwin, S.; Kochevar, D.; Lissemore, K.; et al. Assessing Clinical Competency: Reports from Discussion Groups. *J. Vet. Med. Educ.* **2008**, *35*, 343–353. [CrossRef] [PubMed]
274. Dent, A.W.; Weiland, T.J.; Paltridge, D. Australasian emergency physicians: A learning and educational needs analysis. Part Four: CPD topics desired by emergency physicians. *Emerg. Med. Australas.* **2008**, *20*, 260–266. [CrossRef] [PubMed]
275. Kobayashi, L.; Shapiro, M.J.; Gutman, D.C.; Jay, G. Multiple Encounter Simulation for High-acuity Multipatient Environment Training. *Acad. Emerg. Med.* **2007**, *14*, 1141–1148. [CrossRef]
276. Cheng, A.; Duff, J.; Grant, E.; Kissoon, N.; Grant, V.J. Simulation in paediatrics: An educational revolution. *Paediatr. Child Health* **2007**, *12*, 465–468. [CrossRef] [PubMed]
277. Bond, W.F.; Lammers, R.L.; Spillane, L.L.; Smith-Coggins, R.; Fernandez, R.; Reznek, M.A.; Vozenilek, J.A.; Gordon, J.A. The Use of Simulation in Emergency Medicine: A Research Agenda. *Acad. Emerg. Med.* **2007**, *14*, 353–363. [CrossRef]
278. Delooz, H.; Debacker, M.; Moens, G.; Johannik, K. European survey on training objectives in disaster medicine. *Eur. J. Emerg. Med.* **2007**, *14*, 25–31. [CrossRef]
279. Vozenilek, J. See One, Do One, Teach One: Advanced Technology in Medical Education. *Acad. Emerg. Med.* **2004**, *11*, 1149–1154. [CrossRef]
280. Wisborg, T.; Ronning, T.H.; Beck, V.B.; Brattebo, G. Preparing teams for low-frequency emergencies in Norwegian hospitals. *Acta Anaesthesiol. Scand.* **2003**, *47*, 1248–1250. [CrossRef]
281. Bond, W.F.; Spillane, L.; The CORD Core Competencies Simulation Group. The Use of Simulation for Emergency Medicine Resident Assessment. *Acad. Emerg. Med.* **2002**, *9*, 1295–1299. [CrossRef]
282. Hayden, S.R.; Dufel, S.; Shih, R. Definitions and Competencies for Practice-based Learning and Improvement. *Acad. Emerg. Med.* **2002**, *9*, 8. [CrossRef]
283. Malloy, K.M.; Lieu, J.E.C.; Cervenka, B.P.; Deutsch, E.S.; Malekzadeh, S. Regionalization of ORL Boot Camps: Report of the Society of University Otolaryngologists Task Force. *Laryngoscope* **2021**, *131*, 737–743. [CrossRef] [PubMed]

284. Walsh, B.M.; Wong, A.H.; Ray, J.M.; Fralliciardi, A.; Nowicki, T.; Medzon, R.; Bentley, S.; Stapleton, S. Practice Makes Perfect. *Emerg. Med. Clin. North Am.* **2020**, *38*, 363–382. [CrossRef] [PubMed]
285. Reuter, P.-G.; Chauvin, A.; Javaud, N.; Adnet, F.; Lapostolle, F.; Yordanov, Y. Interventional studies performed in emergency medical communication centres: Systematic review. *Eur. J. Emerg. Med.* **2020**, *27*, 21–26. [CrossRef]
286. Bracq, M.-S.; Michinov, E.; Jannin, P. Virtual Reality Simulation in Nontechnical Skills Training for Healthcare Professionals: A Systematic Review. *Simul. Healthc. J. Soc. Simul. Healthc.* **2019**, *14*, 188–194. [CrossRef]
287. Chauvin, A.; Truchot, J.; Bafeta, A.; Pateron, D.; Plaisance, P.; Yordanov, Y. Randomized controlled trials of simulation-based interventions in Emergency Medicine: A methodological review. *Intern. Emerg. Med.* **2017**, *13*, 1–12. [CrossRef]
288. von Wendt, C.E.A.; Niemi-Murola, L. Simulation in Interprofessional Clinical Education: Exploring Validated Nontechnical Skills Measurement Tools. *Simul. Healthc. J. Soc. Simul. Healthc.* **2018**, *13*, 131–138. [CrossRef]
289. Fransen, A.F.; de Boer, L.; Kienhorst, D.; Truijens, S.E.; van Runnard Heimel, P.J.; Oei, S.G. Assessing teamwork performance in obstetrics: A systematic search and review of validated tools. *Eur. J. Obstet. Gynecol. Reprod. Biol.* **2017**, *216*, 184–191. [CrossRef] [PubMed]
290. Beal, M.D.; Kinnear, J.; Anderson, C.R.; Martin, T.D.; Wamboldt, R.; Hooper, L. The Effectiveness of Medical Simulation in Teaching Medical Students Critical Care Medicine: A Systematic Review and Meta-Analysis. *Simul. Healthc. J. Soc. Simul. Healthc.* **2017**, *12*, 104–116. [CrossRef]
291. Douglas, H.E.; Raban, M.Z.; Walter, S.R.; Westbrook, J.I. Improving our understanding of multi-tasking in healthcare: Drawing together the cognitive psychology and healthcare literature. *Appl. Ergon.* **2017**, *59*, 45–55. [CrossRef]
292. Brunette, V.; Thibodeau-Jarry, N. Simulation as a Tool to Ensure Competency and Quality of Care in the Cardiac Critical Care Unit. *Can. J. Cardiol.* **2017**, *33*, 119–127. [CrossRef]
293. Havyer, R.D.; Nelson, D.R.; Wingo, M.T.; Comfere, N.I.; Halvorsen, A.J.; McDonald, F.S.; Reed, D.A. Addressing the Interprofessional Collaboration Competencies of the Association of American Medical Colleges: A Systematic Review of Assessment Instruments in Undergraduate Medical Education. *Acad. Med.* **2016**, *91*, 865–888. [CrossRef] [PubMed]
294. Shaw-Battista, J.; Belew, C.; Anderson, D.; van Schaik, S. Successes and Challenges of Interprofessional Physiologic Birth and Obstetric Emergency Simulations in a Nurse-Midwifery Education Program. *J. Midwifery Womens Health* **2015**, *60*, 735–743. [CrossRef] [PubMed]
295. Nord-Ljungquist, H.; Brännström, M.; Bohm, K. Communication and protocol compliance and their relation to the quality of cardiopulmonary resuscitation (CPR): A mixed-methods study of simulated telephone-assisted CPR. *Int. Emerg. Nurs.* **2015**, *23*, 254–259. [CrossRef]
296. Khanduja, P.K.; Bould, M.D.; Naik, V.N.; Hladkowicz, E.; Boet, S. The Role of Simulation in Continuing Medical Education for Acute Care Physicians: A Systematic Review. *Crit. Care Med.* **2015**, *43*, 186–193. [CrossRef]
297. Lorello, G.R.; Cook, D.A.; Johnson, R.L.; Brydges, R. Simulation-based training in anaesthesiology: A systematic review and meta-analysis. *Br. J. Anaesth.* **2014**, *112*, 231–245. [CrossRef]
298. Marshall, S. The Use of Cognitive Aids during Emergencies in Anesthesia: A Review of the Literature. *Anesth. Analg.* **2013**, *117*, 1162–1171. [CrossRef]
299. Chalwin, R.P.; Flabouris, A. Utility and assessment of non-technical skills for rapid response systems and medical emergency teams: Non-technical skills training for MET. *Intern. Med. J.* **2013**, *43*, 962–969. [CrossRef]
300. Deering, S.; Auguste, T.; Lockrow, E. Obstetric simulation for medical student, resident, and fellow education. *Semin. Perinatol.* **2013**, *37*, 143–145. [CrossRef]
301. Timbie, J.W.; Ringel, J.S.; Fox, D.S.; Pillemer, F.; Waxman, D.A.; Moore, M.; Hansen, C.K.; Knebel, A.R.; Ricciardi, R.; Kellermann, A.L. Systematic Review of Strategies to Manage and Allocate Scarce Resources during Mass Casualty Events. *Ann. Emerg. Med.* **2013**, *61*, 677–689.e101. [CrossRef] [PubMed]
302. Andreatta, P.; Marzano, D. Healthcare management strategies: Interdisciplinary team factors. *Curr. Opin. Obstet. Gynecol.* **2012**, *24*, 445–452. [CrossRef]
303. Deiorio, N.M.; Fitch, M.T.; Jung, J.; Promes, S.B.; Thibodeau, L.G.; Woolley, W.L.; Gisondi, M.A.; Gruppen, L.D. Evaluating Educational Interventions in Emergency Medicine. *Acad. Emerg. Med.* **2012**, *19*, 1442–1453. [CrossRef]
304. Flowerdew, L.; Brown, R.; Vincent, C.; Woloshynowych, M. Identifying Nontechnical Skills Associated With Safety in the Emergency Department: A Scoping Review of the Literature. *Ann. Emerg. Med.* **2012**, *59*, 386–394. [CrossRef]
305. Carne, B.; Kennedy, M.; Gray, T. Review article: Crisis resource management in emergency medicine: Crisis resource management in emergency medicine. *Emerg. Med. Australas.* **2012**, *24*, 7–13. [CrossRef] [PubMed]
306. Eyck, R.P.T. Simulation in Emergency Medicine Training. *Pediatr. Emerg. Care* **2011**, *27*, 12.
307. Fernandez, R.; Wang, E.; Vozenilek, J.A.; Hayden, E.; McLaughlin, S.; Godwin, S.A.; Griswold-Theodorson, S.; Davenport, M.; Gordon, J.A. Simulation Center Accreditation and Programmatic Benchmarks: A Review for Emergency Medicine: Simulation center accreditation and programmatic benchmarks. *Acad. Emerg. Med.* **2010**, *17*, 1093–1103. [CrossRef]
308. Merién, A.E.R.; van de Ven, J.; Mol, B.W.; Houterman, S.; Oei, S.G. Multidisciplinary Team Training in a Simulation Setting for Acute Obstetric Emergencies. *Obstet. Gynecol.* **2010**, *115*, 11. [CrossRef] [PubMed]
309. Boulet, J.R.; Murray, D.J.; Warner, D.S. Simulation-based Assessment in Anesthesiology. *Anesthesiology* **2010**, *112*, 1041–1052. [CrossRef] [PubMed]

310. Okuda, Y.; Bryson, E.O.; DeMaria, S.; Jacobson, L.; Quinones, J.; Shen, B.; Levine, A.I. The Utility of Simulation in Medical Education: What Is the Evidence?: Utility of simulation in medical education. *Mt. Sinai J. Med. J. Transl. Pers. Med.* **2009**, *76*, 330–343. [CrossRef]
311. Weinberg, E.R.; Auerbach, M.A.; Shah, N.B. The use of simulation for pediatric training and assessment. *Curr. Opin. Pediatr.* **2009**, *21*, 282–287. [CrossRef]
312. Fox-Robichaud, A.E.; Nimmo, G.R. Education and simulation techniques for improving reliability of care. *Curr. Opin. Crit. Care* **2007**, *13*, 737–741. [CrossRef]
313. Bressan, F.; Buti, G.; Boncinelli, S. Medical simulation in anesthesiology training. *Minerva Anestesiol.* **2007**, *73*, 1–11.
314. Eppich, W.J.; Adler, M.D.; McGaghie, W.C. Emergency and critical care pediatrics: Use of medical simulation for training in acute pediatric emergencies. *Curr. Opin. Pediatr.* **2006**, *18*, 266–271. [CrossRef] [PubMed]
315. Patrick Müller, M.; Hänsel, M.; Hübler, M.; Koch, T. Errors leading to an incident—Strategies for improving patient safety in anaesthesiology. *Anasthesiol. Intensivmed.* **2006**, *47*, 13–24.
316. MacNaughton, K.; Chreim, S.; Bourgeault, I.L. Role construction and boundaries in interprofessional primary health care teams: A qualitative study. *BMC Health Serv. Res.* **2013**, *13*, 486. [CrossRef] [PubMed]
317. Kutzin, J.; Golden, A.; Cassara, M. Task Trainers in Emergency Care Simulation. In *Comprehensive Healthcare Simulation: Emergency Medicine*; Strother, C., Okuda, Y., Wong, N., McLaughlin, S., Eds.; Springer International Publishing: Cham, Switzerland, 2021; pp. 115–121. [CrossRef]
318. Kolb, D.A. *Experiential Learning: Experience as the Source of Learning and Development*, 2nd ed.; Prentice Hall: Englewood Cliffs, NJ, USA, 1983.
319. DeCoux, V.M. Kolb's Learning Style Inventory: A review of its applications in nursing research. *J. Nurs. Educ.* **1990**, *29*, 202–207. [CrossRef]
320. Thomas, P.A.; Kern, D.E.; Hughes, M.T.; Tackett, S.A.; Chen, B.Y. (Eds.) *Curriculum Development for Medical Education: A Six-Step Approach*, 4th ed.; Johns Hopkins University Press: Baltimore, MD, USA, 2022.
321. Chen, B.Y.; Kern, D.E.; Kearns, R.M.; Thomas, P.A.; Hughes, M.T.; Tackett, S. From Modules to MOOCs: Application of the Six-Step Approach to Online Curriculum Development for Medical Education. *Acad. Med. J. Assoc. Am. Med. Coll.* **2019**, *94*, 678–685. [CrossRef]
322. Whitworth, K.A.; Long, J.P. Certification in Medical Simulation. In *StatPearls*; StatPearls Publishing: Treasure Island, FL, USA, 2022. Available online: http://www.ncbi.nlm.nih.gov/books/NBK560711/ (accessed on 6 December 2022).
323. Barnes, J.J.; Konia, M.R. Exploring Validation and Verification: How they Different and What They Mean to Healthcare Simulation. *Simul. Healthc. J. Soc. Simul. Healthc.* **2018**, *13*, 356–362. [CrossRef]
324. Guerrero, J.G.; Hafiz, A.H.; Eltohamy, N.A.E.; Gomma, N.; Jarrah, I.A. Repeated Exposure to High-fidelity Simulation and Nursing Interns' Clinical Performance: Impact on Practice Readiness. *Clin. Simul. Nurs.* **2021**, *60*, 18–24. [CrossRef]
325. Wright, A.; Moss, P.; Dennis, D.M.; Harrold, M.; Levy, S.; Furness, A.L.; Reubenson, A. The influence of a full-time, immersive simulation-based clinical placement on physiotherapy student confidence during the transition to clinical practice. *Adv. Simul. Lond. Engl.* **2018**, *3*, 3. [CrossRef]
326. Hardenberg, J.; Rana, I.; Tori, K. Evaluating Impact of Repeated Exposure to High Fidelity Simulation: Skills Acquisition and Stress Levels in Postgraduate Critical Care Nursing Students. *Clin. Simul. Nurs.* **2020**, *48*, 96–102. [CrossRef]
327. Huang, W.-C.; Hsu, S.-C.; Yang, C.-H.; Lin, C.-W.; Suk, F.-M.; Hu, K.-C.; Wu, Y.-Y.; Chen, H.-Y.; Hsu, C.-W. A novel approach: Simulating multiple simultaneous encounters to assess multitasking ability in emergency medicine. *PLoS ONE* **2021**, *16*, e0257887. [CrossRef] [PubMed]
328. Zhang, C.; Hauge, J.B.; Härenstam, K.P.; Meijer, S. Game Experience and Learning Effects of a Scoring-Based Mechanic for Logistical Aspects of Pediatric Emergency Medicine: Development and Feasibility Study. *JMIR Serious Games* **2021**, *9*, e21988. [CrossRef]
329. Filippeschi, A.; Brizzi, F.; Ruffaldi, E.; Jacinto Villegas, J.M.; Landolfi, L.; Avizzano, C.A. Evaluation of diagnostician user interface aspects in a virtual reality-based tele-ultrasonography simulation. *Adv. Robot.* **2019**, *33*, 840–852. [CrossRef]
330. Institute of Medicine (US) Committee on Quality of Health Care in America. *To Err is Human: Building a Safer Health System*; National Academies Press: Washington, DC, USA, 2000. Available online: http://www.ncbi.nlm.nih.gov/books/NBK225182/ (accessed on 26 February 2023).
331. Mustafee, N.; Katsaliaki, K.; Taylor, S.J.E. Profiling Literature in Healthcare Simulation. *Simulation* **2010**, *86*, 543–558. [CrossRef]
332. Sklar, D.P. Competencies, Milestones, and Entrustable Professional Activities: What They Are, What They Could Be. *Acad. Med.* **2015**, *90*, 395. [CrossRef] [PubMed]

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