Multidisciplinary in-hospital teams improve patient outcomes: A review

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Abstract

Background: The use of multidisciplinary in-hospital teams limits adverse events (AE), improves outcomes, and adds to patient and employee satisfaction.

Methods: Acting like "well-oiled machines," multidisciplinary in-hospital teams include "staff" from different levels of the treatment pyramid (e.g. staff including nurses' aids, surgical technicians, nurses, anesthesiologists, attending physicians, and others). Their enhanced teamwork counters the "silo effect" by enhancing communication between the different levels of healthcare workers and thus reduces AE (e.g. morbidity/mortality) while improving patient and healthcare worker satisfaction.

Results: Multiple articles across diverse disciplines incorporate a variety of concepts of "teamwork" for staff covering emergency rooms (ERs), hospital wards, intensive care units (ICUs), and most critically, operating rooms (ORs). Cohesive teamwork improved communication between different levels of healthcare workers, and limited adverse events, improved outcomes, decreased the length of stay (LOS), and yielded greater patient "staff" satisfaction.

Conclusion: Within hospitals, delivering the best medical/surgical care is a "team sport." The goals include: Maximizing patient safety (e.g. limiting AE) and satisfaction, decreasing the LOS, and increasing the quality of outcomes. Added benefits include optimizing healthcare workers' performance, reducing hospital costs/complications, and increasing job satisfaction. This review should remind hospital administrators of the critical need to keep multidisciplinary teams together, so that they can continue to operate their "well-oiled machines" enhancing the quality/safety of patient care, while enabling "staff" to optimize their performance and enhance their job satisfaction.

Key Words: Improved outcomes, medicine, multidisciplinary approaches, patient safety, quality of care, spine, surgery, teamwork

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INTRODUCTION

Hospital-based "multidisciplinary teams" often involve all levels of "staff" on the treatment pyramid including aides, nurses, physician assistants, physical therapists, social workers, anesthesiologists, and attending physicians. These "teams" are consistently more effective than randomly assigning staff to the emergency room (ER),

the floors, the Intensive Care Unit (ICU), the operating room (OR), or other locals. These "teams," acting as "well-oiled machines," counteract the "silo or halo effect" (e.g. characterized by the "I am too important because I am…"), break down communication barriers between specialists, and provide better cooperation among all specialists. Utilizing such cohesive teams limits adverse events (AE) (e.g. including morbidity/mortality), improves patient outcomes, decreases patient length of stay (LOS), and increases patient satisfaction. Additional benefits for the "staff" include improved job performance, reduced AE/complications, reduced costs, and increased job satisfaction, while the "staff" and hospitals benefit from greater retention of experienced personnel. We must continue to work with our hospital administrators to ensure that these "multidisciplinary teams" stay together for the "greater good" of the patient, "staff," and the institution.

TEAMWORK INVOLVED IN RESPIRATORY CARE

Respiratory team offered consistent care irrespective of whether a junior or senior resident rotates through the service

Tsai *et al*. asked whether junior versus senior medical residents provided worse care in a respiratory care center (RCC) where there was a consistent "team" in place utilizing an established "weaning protocol" [Table 1].[23] The team consisted of attending physicians in charge, a nurse practitioner, a case manager, a dietitian, a pharmacist, a social worker, registered respiratory therapists, and a nursing staff. This 7-year retrospective study involved two medical residents (junior vs. senior) with ICU training; outcomes were measured by studying the monthly weaning rate, mortality rate, assessment of mean ventilator days, returns to the ICU, and the incidence of nosocomial infections. Notably, they found no significant differences between any of these rates and the levels of training (e.g. junior vs. senior) of the residents in the ICU. In short, having an established team and protocol in place led to no increase in adverse outcomes no matter what the level of training of the on-call residents.

Staff training beneficially impacts mechanically ventilated patients

Bloos *et al*. assessed whether staff training in pre-defined interventions (bundle) improved the quality of care in mechanically ventilated patients [Table 1].[6] The study was set in a 50-bed ICU where they applied a "ventilator bundle" that included semi-recumbent positioning, lung protective ventilation in patients with acute lung injury (ALI), ulcer prophylaxis e.g. hospital-acquired pressure ulcers (HAPUs), and deep vein thrombosis prophylaxis (DVTP). All factors were evaluated before and after the staffs were trained to care for postoperative patients who warranted mechanical ventilation for a minimum of 24 h. There were 133 patients under their care before and 141 patients being cared for after staff training. When performing this study, the overall "bundle adherence" (e.g. participation in the factors necessary for patient care) increased from 15 to 33.8% ($P < 0.001$) and included semi-recumbent positioning (24.9% for before vs. 46.9% after), DVTP (89.5-91.5%), and ulcer prophylaxis (>90% both groups). Furthermore, days on the ventilator were reduced from 6 to 4. Although the overall ICU LOS mortality, and rate of pneumonia [ventilator-associated pneumonia (VAP)] remained the same, the median ICU LOS was reduced by 9 days. The authors concluded that staff training by an ICU change team improved compliance to a pre-defined ventilator bundle.

NURSING TEAMWORK IN PREVENTION OF PSYCHIATRIC DISORDERS

Role of nursing in detection and prevention of ICU psychosis: Not a disease but a complication/failure of nursing treatment

Justic asked whether ICU psychosis represents a failure in treatment rather than a "disease" and focused on how better nursing care could prevent this "complication" in the future [Table 1].[13] The author pointed out that ICU psychosis does not occur in all patients, but many are at risk for "hypoactive, hyperactive, or mixed hypoactive and hyperactive delirium." This study focused on prevention, e.g. the reduction of medications contributing to psychosis, the utilization of adequate psychiatric treatment, and the management of physiological conditions that arise and contribute to psychosis. The author focused on the many AE that follow the onset of delirium: Increased morbidity/mortality, longer LOS, reduced level of function, increased nursing home referrals, and greater post discharge "stress response syndromes." They emphasized the active role that good nursing can play in avoiding delirium by utilizing different protocols/methodologies that should include checking/choosing medications and dosing requirements, while closely following/recognizing side effects.

Certainly, the ICU physicians, nurses, and other staff should equally recognize and treat the "ICU psychosis" that occurs without medication in elderly people (with) a loss of their environment and exposure to ICU disorganization and interruptions of their lives by strangers, and the fear of what is happening is enough to drive anyone off the deep end (personal communication, James I. Ausman, MD). Treating this type of psychosis requires reorientation and empathy from typically over-worked (and under-trained) staff, support from family members, and the ready availability of psychiatry/

Table 1: Benefits of multidisciplinary in-hospital teams

Title	Summary
Teamwork involved in respiratory care Respiratory team offered consistent care irrespective of whether a junior or senior resident rotates through the service	Tsai *et al.* asked whether junior versus senior medical residents provided worse care in a respiratory care center (RCC) where there was a consistent "team" in place utilizing an established "weaning protocol."[23] The authors concluded that with such a protocol in place, the level of training of the residents led to no specific increase in adverse outcomes or events
Staff training beneficially impacts mechanically ventilated patients	Bloos *et al.* assessed whether staff training in pre-defined interventions (bundles) improves the quality of care in mechanically ventilated patients.[6] They concluded that such staff training not only improved compliance, but also reduced days on a ventilator from 6 to 4, along with reducing the median ICU LOS by 9 days
Nursing teamwork in prevention of psychiatric disorders Role of nursing in detection and prevention of ICU psychosis: Not a disease but a complication/failure of nursing treatment	Justic asked whether ICU psychosis represents a failure in nursing treatment rather than a "disease" and focused on how better nursing care could prevent future psychotic events.[13] The aim was to avoid delirium in the first place utilizing different protocols and methodologies that include checking/choosing medications and dosing requirements, while closely following/recognizing side effects
The benefits of "team" climate/attitudes among nurses on acute psychiatric wards	Koivunen *et al.* evaluated whether team climate and attitudes regarding information and communication technology (ICT) between nurses and staff working in acute psychiatric wards would impact the working environment.[14] They concluded, "More attention should be paid to psychosocial factors such as group education and co-operation at work when ICT applications are implemented in nursing"
Teamwork in ear, nose, and throat (ENT) surgery Centralized team services for children with orofacial clefts in the United Kingdom	Scott *et al.* looked at cleft lip and/or palate services in the UK and whether they complied with the Clinical Standards Advisory Group (CSAG) guidelines.[22] These teams were multidisciplinary. Of interest, only one team met all of the CSAG recommendations; they have not yet demonstrated whether these teams have yielded better outcomes
The benefit of ENT teams performing surgery in Nigeria	Adobamen and Egbage studied the beneficial impact (e.g. synergistic effect) of utilizing a team approach to perform ENT surgery in Nigeria.[1] Of 124 patients, 99 patients were reviewed by two consultants, while 25 were seen by three of four consultants. Teamwork within the ENT department resulted in a synergistic benefit to the individual patient and resulted in more experience for all members of the staff
How teamwork impacts neuroscience units How hospital-acquired pressure ulcers in a neuroscience unit were reduced by a skin and wound assessment team	In 2008, McGuinness *et al.* evaluated whether the incidence of hospital-acquired pressure ulcers (HAPUs) in a neurosurgical/neurological in-patient ICU could be reduced by utilizing a skin and wound assessment team (SWAT).[16] The team included those on duty (e.g. no additional staffing was used, and therefore, there was no increased cost); one or two "expert" nurses/nursing assistants rounded on all patients once a week. The SWAT decreased HAPUs by 48% in 2009, 57% in 2010, and 61% in 2011. The SWAT program is now followed hospital-wide
Satisfaction analysis of family members of survivors in a neuroscience ICU	Hwang *et al.* evaluated family satisfaction when their loved ones were cared for in a neuroscience ICU setting versus hospital's medical ICU (MICU).[11] Patients were completely satisfied with the extent of respect/compassion received from NICU staff in 76.3% of cases versus 92.7% for the MICU; less than 60% of neuro-ICU families were completely satisfied by the (1) frequency of physician communication, (2) inclusion and support during decision making, and (3) control over the care of their loved ones
Teamwork and team training benefit health care delivery in ICU and the ORs Simulation-based OR team training of interprofessional students	Paige *et al.* evaluated the impact of effective teamwork in the operating room (OR) and how this is often derailed by the "silo mentality" of different specialists (e.g. not listening to one's colleagues and following a hierarchy).[18] The authors concluded, "high-fidelity simulation OR interprofessional student team training improves students' team-based attitudes and behaviors"
Business principles in the OR: OR planning, management, and strategy	Ausman notes that the efficacy and attitudes of operative teams depend on physician leadership, as he states thus: "It comes from the 'top-down.'"[5] Ausman goes on to note that the surgeons must set the tone in the OR, must take full responsibility for surgical planning as well as organizing the staff and asking for the correct equipment ahead of time. He also emphasizes the need for limiting distractions (e.g. music, taking) for working with a consistent, knowledgeable staff and for operating with residents familiar with the patient and operative plan (noting that this has become a rarity due to restricted hours)
How IP teamwork improves performance for students in simulated codes	Garbee *et al.* evaluated whether utilizing crisis resource management (CRM) principles and high-fidelity human patient simulation (HFHPS) for IP team training would effectively educate undergraduate nurses, nurse anesthetists, medical and respiratory therapists in the team management of codes.[9] In their 1-year study, mean scores increased and were retained following training; if there was any decrease, these were supported by repeat training in the spring
Fewer communication errors when ICU fellows/residents take call in the hospital versus at home	Williams *et al.* looked at the quality of outcomes observed for cardiorespiratory events occurring in an ICU when fellows were taking call in the hospital (IHFC) versus at home coverage (HC).[24]

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Table 1: Contd...

Title	Summary
	Overall, they found that fellows taking in-house call had fewer communication errors and thus better outcomes versus those taking call at home; this was also true irrespective of the level of training (e.g. comparable results for junior vs. senior residents)
The quality of performance for those with nontechnical skills in managing the acute trauma patient impact performance and quality of patient care	Pucher *et al.* acknowledged that managing the acute trauma patient involves the critical and timely interaction of a "team" including multiple specialists as well as those with nontechnical skills.[21] The authors evaluated 50 trauma calls; better teamwork including those involved in nontechnical procedures significantly decreased disposition time
Shift change handovers: Interruptions and time duration may negatively impact patient care	In France, Estryn-Behar *et al.* utilized two surveys to assess the quality of shift changes/handovers (SCH).[8] They analyzed the frequency of interruptions and the quality of care delivered to patients based upon analysis of questionnaires from 29 registered nurses (RNs), 18 nursing aides (NAs), and 14 full-time physicians. For NAs, SCHs were similar, with interruptions causing 10.3% of the working time to be reduced; for physicians, SCHs were shorter or simply did not exist. The authors concluded that better/longer change of shift communications with fewer interruptions would improve patient safety and quality of care
Teamwork in the OR: Benefits of "Time Outs" and limiting distractions 　A team approach for seriously injured patients: The value of simultaneous interventional radiology and operative surgery	D'Amours *et al.* assessed the value of combining interventional radiology and operative suites to manage seriously injured patients with thoracic, abdominal, pelvic, and extremity trauma in select trauma centers.[7] The hybrid suite model, utilizing a trained multidisciplinary team, offered expedited hemorrhage control utilizing "synergistic operative, interventional radiology, and resuscitative platforms"
The efficacy of Time Out (preprocedural checklist) for the OR team	Porter *et al.* evaluated the efficacy of "Time Out" protocols (checklist) in assessing the preparedness of the OR team (e.g. preprocedural pauses or PPP).[20] The PPP helped enforce good teamwork in the ORs, improved outcomes, and helped verify the correct surgical site, patient, and operative side
Interruptions and distractions in the OR interfere with teamwork and surgical flow	Antoniadis *et al.* looked at the frequency of intraoperative distractions/interruptions and assessed whether they interfered with surgery, increased patient morbidity, and added stress for the surgical team.[3] For the 65 mostly abdominal/orthopedic surgical cases, performed over an average of 1 h and 23 min, interruptions/disruptions occurred in 803 instances, yielding an average of 9.82 per hour. Although the common interruptions/disruptions involved people entering/exiting the OR, followed by telephone or beeper calls, equipment failures and OR environment-related disruptions were rated as the highest interference of OR team functioning
Attitudes of team members regarding near misses and Time Out protocols	Haugen *et al.* questioned OR personnel (anesthesia, surgeon, nurses, nurse anesthetists) regarding the utility of Time Outs to reduce the frequency of surgical errors or near misses in the OR (e.g. wrong surgery, wrong patient, wrong site).[10] The authors concluded that most OR surgical personnel had experienced near misses and that 91% favored Time Outs
Surgical team participation in Time Out (Surgical Safety Checklist)	Papaconstantinou *et al.* evaluated the disparate views of the surgical team toward the World Health Organization's (WHO) Surgical Safety Checklist or "Time Out" aimed at minimizing morbidity/mortality and complications worldwide.[19] Questionnaires were answered by 153 (35%) nurses, 104 (24%) anesthesia providers, and 180 (41%) surgeons. Overall, 65% thought that the Time Out strategy enhanced patient safety, but noted some discordance/communication barriers between the surgeons and other members of the team
Negative impact on teamwork by disruptive surgeons	Jacobs and Wile assessed the consequences of outbursts/temper tantrums from surgeons in the OR.[12] They concluded, "Surgeons who abuse other health care workers are in violation of institutional bylaws and compliance regulations and create a hostile environment at work which adversely affects efficient productivity and violates specific State and Federal laws which prohibit discrimination based on race, color, sex, religion, or national origin." Ausman recently noted, "I have never seen an operating team improve under the outbursts of the surgery. Only further deterioration in participation occurs and the patient suffers. This behavior is unacceptable…" (personal communication James I. Ausman, MD)
Teamwork in the OR: Benefits of keeping teams together	Anderson and Talsma evaluated how OR teams beneficially impacted the safety and efficiency for general and neurosurgical procedures.[2] Team coreness, a measure of how often the team worked together, correlated with the duration of the surgery; early procedures were more likely to retain high core team members, while fewer were involved later in the day. Registered nurses comprised most of the "core" interdisciplinary team members in both operative groups
Reduced turnover time and increased efficiency in using specialty OR teams	Mangum and Cutler noted that more efficient OR subspecialty teams reduce turnover times and increase efficacy and well as safety on a neurosurgical service.[15] Redesigning the neurosurgical suite and simplification of processes resulted in a 33-55% reduction in turnover times and increased team efficiency, largely attributed to the greater capability of the subspecialized nursing team

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Title	Summary
Ways to improve OR efficiency	Overdyk *et al.* studied the reasons for OR times/delays in an academic setting and focused on multidisciplinary strategies for improvement.[17] They looked at 94 cases before and following 2 weeks of multidisciplinary OR efficiency awareness education for the nurses, surgeons, and anesthesiologists. Post-education, data were obtained from 1787 participants; following education, start times for the first case of the day, times for patient in the room, when anesthesia was ready, the surgical preparation/start time, and procedure start times were "significantly earlier" ($P<0.01$)
Motivation for multicenter simulation training for OR Teams	Arraiga *et al.* evaluated the possibility of utilizing a "standardized teamwork training program" including complete operating teams at multiple centers.[4] The teams determined that the scenarios were realistic (94%), appropriately challenging (95.4%), relevant (96.3%), and would increase the safety of patients (92.6%). The authors concluded that implementing a standardized multicenter team-training program for complete operative teams in the OR beneficially impacted the functionality of the team.

RCC: Respiratory care center, ICU: Intensive care units, ENT: Ear, nose, and throat, CSAG: Clinical Standards Advisory Group, OR: Operating room, CRM: Crisis resource management, HFHPS: High-fidelity human patient simulation, IHFC: In-hospital fellow coverage, SCH: Shift changes/handovers, RNs: Registered nurses, NAs: Nursing aides, WHO: World Health Organization

social workers along with early ambulation and early discharge to home.

The benefits of "team" climate/attitudes among nurses on acute psychiatric wards

Koivunen *et al.* evaluated whether team climate and attitudes regarding information and communication technology (ICT) between nurses and staff working on acute psychiatric wards would impact the working environment [Table 1].[14] They utilized a Finnish modification of the Team Climate Inventory and administered it to nursing staff on nine acute psychiatric wards. This questionnaire had 28 major questions that ranged from #1: Communications in the team are generally open to #28: Recognition if given for a job well-done. It then provides a complex methodology for analyzing the results of the questionnaire. They found that nurses favoring ICT were typically part of a more experienced team, and concluded; "More attention should be paid to psychosocial factors such as group education and co-operation at work when ICT applications are implemented in nursing."

TEAMWORK IN EAR, NOSE, AND THROAT SURGERY

Centralized team services for children with orofacial clefts in the United Kingdom

Scott *et al.* looked at cleft lip and/or palate services in the UK and whether they complied with the Clinical Standards Advisory Group (CSAG) guidelines [Table 1].[22] They utilized a cross-sectional questionnaire survey to assess the 11 UK "teams" treating children with cleft lip/palate. They utilized multidisciplinary teams involving specialists in hearing, orthodontics, pediatric dentistry, primary cleft surgery, psychology, restorative dentistry, secondary surgery, specialist cleft nursing, and speech and language therapy. Notably, although the composition of the teams varied, all included primary cleft surgery and

orthodontics. Questionnaires were answered by 130 of 150 cleft team (87%) members from different sites (e.g. 11 centralized, 17 primary operative, and 61 peripheral sites). Of interest, only one team met all of the CSAG recommendations; they have not yet demonstrated whether these teams have yielded better outcomes.

The benefit of ENT teams performing surgery in Nigeria

Adobamen and Egbage studied the beneficial impact (e.g. synergistic effect) of utilizing a team approach to perform Ear, Nose, and Throat (ENT) surgery in Nigeria [Table 1].[1] The study involved 124 patients; 99 patients (79.84%) were reviewed by two consultants and 25 (20.16%) were reviewed by three of the four consultants. Of these, 79 (63.71%) patients had the benefit of a complimentary management, while 38 (30.65%) had synergistic benefit from the team work. Teamwork within the ENT department benefitted the individual patient while resulting in more experience for all members of the staff.

HOW TEAMWORK IMPACTS NEUROSCIENCE UNITS

How HAPUs in a neuroscience unit were reduced by a skin and wound assessment team

In 2008, McGuinness *et al.* evaluated whether the incidence of HAPUs in a neurosurgical/neurological in-patient ICU could be reduced by utilizing a skin and wound assessment team (SWAT) [Table 1].[16] The protocol for reducing HAPUs involved (1) turning patients every 1-2 h, (2) specialty beds, and (3) a SWAT. The team just included those on duty (e.g. no additional staffing was used, and therefore, there was no increased cost). Additionally, one or two "expert" nurses/nursing assistants (from the staff on duty) rounded on all patients once a week. Examinations, performed from "head to toe," documented all pressure ulcers, and

educated primary nurses/nurse assistants as to how to care for these patients. In 2010, they also added (1) eight Stryker beds, (2) pressure-relieving heel protector boots, and (3) new hospital orientees shadowed the SWAT for one shift (7.5 h). The SWAT decreased HAPUs by 48% in 2009, 57% in 2010, and 61% in 2011. The SWAT program, that was extremely effective in the neuroscience unit, is now followed hospital-wide.

Satisfaction analysis of family members of survivors in a neuroscience ICU

Hwang *et al.* evaluated family satisfaction when their loved ones were cared for in a neuroscience ICU setting, and compared the level of satisfaction to that attained when patients were in the same hospital's medical ICU (MICU) [Table 1].[11] Over a 38-day period, the Family Satisfaction-ICU instrument questionnaire was administered to neuro-ICU and MICU patients' families when discharged; all families experiencing mortalities were excluded. Patients were completely satisfied with the extent of respect/compassion received from neurosurgical intensive care unit (NICU) staff in 76.3% of cases versus 92.7% for the MICU. Respondents were less likely to be completely satisfied with the courtesy of staff if they reported participation in zero formal family meetings. Less than 60% of neuro-ICU families were completely satisfied by the (1) frequency of physician communication, (2) inclusion and support during decision making, and (3) control over the care of their loved ones. Parents of patients were more likely than other relatives to feel very included and supported in the decision-making process. The authors advised that future studies should focus on evaluating strategies for neuro-ICU nurses and physicians to provide better decision-making support and to implement more frequent family meetings. Determining satisfaction with care for those families whose loved ones passed away during their neuro-ICU admission is another potential avenue for future investigation. Nevertheless, one must view these questionnaire results with a healthy degree of skepticism, particularly as patients and their families may anticipate that any adverse reporting may have negative repercussions regarding their future care (personal communication, James I. Ausman, MD).

TEAMWORK AND TEAM TRAINING BENEFIT HEALTH CARE DELIVERY IN ICU AND THE ORs

Simulation-based OR team training of interprofessional students

Paige *et al.* evaluated the impact of effective teamwork in the OR and how this is often derailed by the "silo mentality" of different specialists (e.g. not listening to one's colleagues and following a hierarchy) [Table 1].[18] To address the lack of adequate undergraduate medical and nursing interprofessional (IP) education, the authors

instituted an IP student OR team training program using high-fidelity simulation (HFS) on students' teams to alter the attitudes/behaviors of team members. There were 10 IP student team training sessions that involved pre-and post-session evaluations. Attendees included 18 nursing students, 20 nurse anesthetist students, and 28 medical students. The found that with these HFS sessions, statistically significant gains occurred on 11 of the 15 self-efficacy items. Therefore, HFS OR IP student team training improves students' team-based attitudes and behaviors. Of interest, they also found that students tend to overestimate their team-based behaviors.

Business principles in the OR: OR planning, management, and strategy

Ausman notes that the efficacy and attitudes of operative teams depend on physician leadership, as he states thus: "It comes from the 'top-down.'"[5] Not only are surgeons responsible for the preoperative surgical planning, but also they must inform/educate the OR staff regarding operative requirements (e.g. position, procedures, equipment) ahead of time. Ausman astutely points out that surgeons need to be secure in their technical expertise and socially capable of managing and interacting with their staff as decent human beings. For example, they must avoid blaming others for their own mistakes; "Are you the type who does nothing wrong and blames all problems on something else? Do you blame the nurses or anesthesiologists for your frustrations during surgery? Are you the 'king'? Do you resort to language and behavior that would be unacceptable anywhere else? Do you throw instruments?"[5] He goes on to discuss major reasons maintaining an organized OR team: "Do you have the same operating room personnel working for you regularly, or are they changing all the time? How does this affect the outcome of your surgery? How can you get the operating room personnel to function as a team consistently?"[5]

Ausman goes on to cite other major problems in the OR that include music and talking as distractions that potentially increase the operative risks, residents assisting who, due to the change in hourly requirements, were not present for the patient work-up and know little about the indications for surgery or operative plan and who, based on many fewer surgical contact hours (greatest reduction in the US), pick up fewer technical surgical or social-interactive OR skills. Ausman concludes that the lesson to be learned is to "…standardize as much as you can including the operating team, the equipment you use, and the various steps in the procedure."[5]

How IP teamwork improves performance for students in simulated codes

Garbee *et al.* evaluated whether utilizing crisis resource management (CRM) principles and high-fidelity human patient simulation (HFHPS) for IP team training

would effectively educate undergraduate nurses, nurse anesthetists, medical and respiratory therapists in the team management of codes [Table 1].[9] Their aim was to improve teamwork/communication by breaking down "silos in education" (e.g. hierarchy). Their 1-year study assessed the learning/retention of teamwork/communication skills; there were 52 students in the fall semester, while 40 returned in the spring. They discovered that mean scores increased and were retained following training; if there was any decrease, these were supported/improved by repeated training in the spring.

Fewer communication errors when ICU fellows/residents take call in the hospital versus at home

Williams *et al.* looked into whether coverage by fellows in the hospital (in-hospital fellow coverage or IHFC) versus at home coverage (HC) of ICUs regarding cardiorespiratory events impacted clinical outcomes [Table 1].[24] They acknowledged, "high-intensity staff coverage strategies are associated with lower morbidity and mortality." The hypothesis was that if fellows were readily accessible in the hospital, rather than at home, there would be improved team work/communication regarding patient care strategies. In order to study this, they obtained adequate data from 306 of 312 cardiorespiratory events occurring in 114 surgical ICU patients over a period of 134 days. Of 103 cases where communication errors occurred, fewer were noted for those taking in-house call; residents communicated 89% for IHFC versus 51% of events during HC; of interest, the incidence was comparable for junior versus senior residents. They concluded that communication errors were reduced for residents taking in-house call.

The quality of performance for those with nontechnical skills in managing the acute trauma patient impact performance and quality of patient care

Pucher *et al.* acknowledged that managing the acute trauma patient involves the critical and timely interaction of a "team" including multiple specialists [Table 1].[21] However, few earlier studies evaluated the performance of those with nontechnical skills (T-NOTECHS) who also comprised the trauma team. They assessed the time required for care assessment and treatment, delays/errors, the impact on Injury Severity Scores (ISS), and whether any of these factors were changed by the time of day. The authors evaluated 50 trauma calls; better teamwork and nontechnical performance significantly decreased disposition times.

Shift change handovers: Interruptions and time duration may negatively impact patient care

In France, Estryn-Behar *et al.* utilized two surveys to assess the quality of shift changes/handovers (SCH) between shifts; this included assessing the frequency of interruptions and the quality of care delivered to patients based on an analysis of questionnaires from 29 registered nurses (RNs), 18 nursing aides (NAs), and 14 full-time physicians [Table 1].[8] The authors concluded, "SCHs are being reduced or eliminated in France to reduce staff costs." The authors sought to document how shortening SCH reduced the efficiency, team function, and quality of care delivered by these teams of medical specialists. First, they observed that RNs spent an average of 15 min on SCH at the start of their shifts, but only 13 min at the end of the shift. This included an average of 50 interruptions that took up to 16% of the "working time." For NAs, SCHs were similar, with interruptions causing 10.3% of the working time to be reduced; for physicians, SCHs were shorter or simply did not exist. The authors recommended that better/longer change of shift communications with fewer interruptions would improve/maintain patient safety and quality of care.

TEAMWORK IN THE OR: BENEFITS OF "TIME OUTS" AND LIMITING DISTRACTIONS

A team approach for seriously injured patients: The value of simultaneous interventional radiology and operative surgery

D'Amours *et al.* assessed the value of combining interventional radiology and operative suites in managing seriously injured patients with thoracic, abdominal, pelvic, and extremity trauma in select trauma centers [Table 1].[7] The hybrid suite model, utilizing a trained multidisciplinary team, offered expedited hemorrhage control utilizing "synergistic operative, interventional radiology, and resuscitative platforms." This required multidisciplinary teams, ergonomic and workplace considerations, as well as a fundamental paradigm shift for trauma care.

The efficacy of Time Out (preprocedural checklist) for the OR team

Porter *et al.* evaluated the efficacy of "Time Out" protocols in assessing the preparedness of the OR team [Table 1].[20] The uses of these "preprocedural pauses" (PPP) accompanied by a checklist have been shown to; improve teamwork in the ORs, improve outcomes, verify the operative site and side, and confirm that the correct patient is undergoing the procedure (e.g. based upon the Joint Commission's Universal Protocol for Preventing Wrong Site, Wrong Procedure, Wrong Person Surgery). This study evaluated how input from multiple members on the team contributed to the efficacy of the Time Out. Once this procedure was implemented, surgeon-led pauses showed compliance increase from 54 to 97%; members introduced themselves 44% of the time before, but 94% after the change. The authors concluded that the PPP, involving all members of the OR team, promoted improvement in overall teamwork. This required no

greater cost and minimal administrative support after the initial implementation of the PPP.

Interruptions and distractions in the OR interfere with teamwork and surgical flow

Antoniadis *et al.* looked at the frequency and severity of intraoperative distractions/interruptions and assessed whether they interfered with surgery, increased patient morbidity, and added to stress for the surgical team [Table 1].[3] They evaluated 65 predominantly abdominal and orthopedic surgical cases at two sites in Germany. The cases averaged 1 h and 23 min, and included a total of 803 interruptions/disruptions; these occurred in an average of 9.82 times per hour. The most common interruptions included: People entering/exiting the OR, followed by telephone or beeper calls. However, equipment failures and OR environment–related disruptions were rated as the highest interference of OR team functioning; these typically occurred at the beginning of the case. The authors concluded that interruptions/distractions occur frequently in the OR and interfere with OR team function. If possible, these should be limited to ensure greater efficiency and enhance the safety of the surgery being performed.

Attitudes of team members regarding near misses and Time Out protocols

Haugen *et al.*'s study evaluated factors that contribute to surgical errors including potentially performing the wrong surgery on the wrong patient at the wrong site [Table 1].[9] Surgeons, anesthetists, nurse anesthetists, and OR nurses answered 14 items on a questionnaire regarding their experience of "near misses or mistakes" in the OR, and how they could be averted in the future (e.g. utilizing the Time Out protocol). Although they found that 91% of team members favored the Time Out protocol, the "team" was unsure of the patient's identity (38%), surgical site/side (81%), was prepared for the wrong procedure (60%), and considered themselves responsible for performing the correct procedures (63%).[10] Furthermore, they noted that only nurse anesthetists routinely performed identity checks prior to surgery ($P \leq 0.001$). The authors concluded that the vast majority of OR surgical personnel experienced near misses in the past and that Time Outs model helped avert these errors.

Surgical team participation in Time Out (Surgical Safety Checklist)

Papaconstantinou *et al.* evaluated the different views of the surgical team regarding the World Health Organization's (WHO) Surgical Safety Checklist or Time Out aimed at minimizing morbidity/mortality and complications worldwide [Table 1].[19] The surgical team filled out the questionnaires 1 month before (45%) and 1 year after (64%) the Time Out protocol was instituted. Those responding to the questionnaire included 153 (35%) nurses, 104 (24%) anesthesia providers, and 180 (41%) surgeons. Overall, 65% of those responding thought the Time Out strategy enhanced patient safety, but noted "some discordance… between surgeons and other surgical team members, indicating that barriers in communication still exist."

Negative impact on teamwork by disruptive surgeons

Jacobs and Wille assessed the consequences of outbursts/temper tantrums from surgeons in the OR [Table 1].[12] Of interest, the medical literature has little regarding the abuse of OR personnel by surgeons. However, surgeon misbehaviors are no longer acceptable, and need to be curtailed before they compromise patient safety or lead to disciplinary actions. The authors concluded, "Surgeons who abuse other health care workers are in violation of institutional bylaws and compliance regulations, and create a hostile environment at work which adversely affects efficient productivity and violates specific State and Federal laws which prohibit discrimination based on race, color, sex, religion, or national origin." Ausman recently noted, "I have never seen an operating team improve under the outbursts of the surgery. Only further deterioration in participation occurs and the patient suffers. This behavior is unacceptable…" (personal communication, James I. Ausman, MD).

Teamwork in the OR: Benefits of keeping teams together

Anderson and Talsma evaluated how OR teams beneficially impacted the safety and efficiency for general and neurosurgical procedures.[2] They evaluated the following variables: Centrality, team coreness, and the core/periphery network structure [Table 1]. Team coreness, a measure of how often the team worked together, correlated with the duration of the surgery; early procedures were more likely to retain high core team members, while fewer were involved later in the day. RNs comprised most of the "core" interdisciplinary team members in both operative groups. The authors concluded, "Many procedures may include staff that are not specialty trained, and later cases are more negatively impacted than earlier ones."

Reduced turnover time and increased efficiency in using specialty OR teams

Mangum and Cutler noted that more efficient OR subspecialty teams reduce turnover times and increase the safety/efficacy on a neurosurgical service [Table 1].[15] Redesigning the neurosurgical suite and simplification of processes resulted in a 33–55% reduction in turnover times and increased team efficiency, largely attributed to the greater capability of the subspecialized nursing team.

Ways to improve OR efficiency

Overdyk *et al.* studied the reasons for OR delays in an academic setting and focused on multidisciplinary

strategies for improvement [Table 1].[17] They looked at 94 cases before and after 2 weeks of multidisciplinary OR efficiency awareness education for the nurses, surgeons, and anesthesiologists. Post-education, data were obtained from 1787 participants; following education, start times for the first case of the day, times for patient in the room, when anesthesia was ready, the surgical preparation/start time, and procedure start times were "significantly earlier" ($P < 0.01$). Specifically, the start time was 22 min earlier, turnover time was decreased by an average of 16 min, and there was a reduction in delays caused by unavailable surgeons, anesthesiologists, and residents. The authors concluded that such studies can increase the efficiency of the OR, and that utilizing a multidisciplinary team approach can improve efficacy resulting in time and cost savings. In short, personal accountability, streamlining of procedures, interdisciplinary team work, and accurate data collection were all important contributors to improved efficiency.

Motivation for multicenter simulation training for OR teams

Arraiga *et al.* evaluated the possibility of utilizing a "standardized teamwork training program" to address complete operating teams at multiple centers [Table 1].[4] Their hypothesis was that operative complications, including patient injury/death, were largely attributable to "failures" in intraoperative teamwork. Therefore, operative simulation for these "teams" would help limit adverse events. They studied four Harvard-affiliated simulation programs aimed at developing a standardized OR teamwork training curriculum that followed the WHO safety checklist. Each team included an average of seven personnel with at least one attending surgeon, one attending anesthesiologist, and one OR nurse. Of the total 221 participants, 99% responded to the surveys (218/221). The teams determined that the scenarios were realistic (94%), appropriately challenging (95.4%), relevant (96.3%), and would increase the safety of patients (92.6%). Of interest, surgeons reported their greatest personal deficit as communication skills, while the OR nurses/anesthesiologists found that surgeons had to work on greater "personal assertiveness." The authors concluded that implementing a standardized multicenter team-training program for complete operative teams in the OR beneficially impacted the functionality of the team.

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