

## Adopting newer strategies of perioperative quality improvement: The bandwagon moves on....

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‘Quality improvement management’ is commonly done by business organisations to improve the process of production output. In the healthcare industry too, since the last few years, quality improvement has been receiving a lot of attention.<sup>[1]</sup> It has always been believed that ‘Change’ is inevitable and is essential for improving the quality and for better adjustments in our lives. Quality improvement in healthcare includes improving patient outcomes by adopting changes and making rapid adaptations.<sup>[2]</sup> Perioperative care including anaesthesia services are domains in which quality assurance is of utmost importance. Quality assurance in this arena aims at ensuring high standards of perioperative care. Ensuring patient safety, resorting to means that can improve clinical decisions in the operation theatre, and adopting modern strategies aimed at minimising perioperative complications can definitely improve the perioperative healthcare delivery system.

Perioperative care has always been challenging since time immemorial; nonetheless, the modern surgical environment is highly multifaceted because of the complexity of surgeries, presence of highly variable co-morbidities in the patients, and the high-tech environment where such surgeries are carried out. It is very likely that patient-safety-related adverse events including patient/surgical site misidentification, clinical and therapeutic misadventures, medication errors, errors in clinical decision-making and omissions

can occur in this composite environment.<sup>[3]</sup> Efforts to ensure patient safety have always been followed globally in a progressive manner. The evidence from various articles published on preoperative evaluation and risk assessment, perioperative monitoring, patient satisfaction and various clinical guidelines and advisories that have been published from time to time undoubtedly shows the intensity of the efforts aimed at ensuring good perioperative outcomes.<sup>[4-10]</sup> In spite of these efforts and advancements, how can we be assured that the existing strategies are good enough to improve patient outcomes? Quality improvement initiatives are certainly challenging.<sup>[11]</sup> Following on the principles of “Change”, is it not the time for us to embrace and adopt more robust strategies to improve and strengthen our perioperative care and anaesthesia services?

### APPLICATION OF SPECIALISED E-TECHNOLOGY IN PERIOPERATIVE CARE

Healthcare technology in perioperative care includes Healthcare information technology (HIT) and Clinical information technology (CIT).<sup>[3]</sup> The use of this e-technology can help reduce human errors, improve clinical outcomes, help coordination of care and track data over time.

HIT includes Computerised physician order entry (CPOE), Clinical decision support systems (CDSSs),

Electronic medical record (EMR), electronic 'Sign out' and 'Hand-off' tools, Bar code medication administration (BCMA), Patient data management systems, telemedicine, Electronic incident reporting and so on.<sup>[12]</sup>

CIT is highly sophisticated and focuses on specific clinical tasks. It includes Picture archive and communication systems, clinical imaging technologies, robotic surgical systems, perfusion and infusion pumps, anaesthesia delivery systems, mechanical ventilators and automated medication cabinets.<sup>[3]</sup> This technology is already being widely used; nevertheless, improvement in perioperative technology including perioperative monitoring, airway devices and intravenous infusion systems has certainly enhanced the quality of perioperative care and has also made the modern perioperative experience very pleasant and safe.<sup>[13]</sup> However, a lot more needs to be incorporated routinely into modern perioperative care.

CPOE involves the use of computers to enter physician medication orders, electronic ordering of tests, procedures and consultations.<sup>[12]</sup> This could be used in perioperative care especially during preanaesthetic evaluation including ordering of preoperative investigations, preoperative ordering of medications and postoperative pain and fluid management.

CDSSs are nowadays becoming popular and are being used to support the use of clinical data science in daily clinical practice.<sup>[14]</sup> A CDS tool provides clinicians, administrative staff, patients and members of the care team with information that is filtered to a specific person or situation.<sup>[15]</sup> There are non-computerised CDS tools like clinical guidelines or digital clinical decision support resources such as Clinical Key® or UpToDate®.<sup>[16]</sup> The merits of these resources are that they are effective in reducing diagnostic errors, improve the quality of patient care and are trusted as evidence-based clinical information resources.<sup>[17]</sup> There are basic or simple CDSSs like lab info systems that highlight critical care values and pharmacy info systems that present alerts in ordering a new drug/when there is a possibility of drug interaction. Old CDSSs like decision tree models use a tree-like model of decisions consisting of multiple steps. Medication-related CDSSs help in checking drug allergies, drug doses and drug interaction, thereby potentially minimising the morbidity and mortality.<sup>[14]</sup>

Several hospitals today have integrated Electronic health records (EHRs) and CPOEs with CDSSs and

have found this to have reduced hospital readmissions, ordering of unnecessary radiological/laboratory investigations and mortality rates.<sup>[15,18]</sup> Many CDSSs have been incorporated into modern perioperative care, anaesthesia and intensive care services to complete drug-dosing calculations, access drug formulary guidelines, use time-triggered reminders for drug delivery and access filtered educational information. DSSs are not novel and are used widely in the developed world. They have been devised for practically every step of the perioperative process, namely DSS for artificial ventilation and weaning (SmartCare™), a complex DSS conceived to assist anaesthesiologists during surgery (Diagnesia) that uses inputs from the anaesthesia panel and gives diagnoses in the descending order, a simple DSS that detects 'light' anaesthesia using the changes in mean arterial pressure as input, a DSS for antibiotic prophylaxis (Smart Anaesthesia Messenger), a DSS for assisting physicians in selecting the right preoperative clinically relevant test [System for preoperative test selection (SPOTS)], a DSS for providing reminders for the prophylaxis of postoperative nausea and vomiting and so on. CDSSs using computerised surveillance algorithms and real time analytics can help alert new diagnosis of sepsis and thus contribute to its early detection. They can give alerts regarding worsening of vital signs in the intensive care unit (ICU) and also generate hourly predictions about ICU patients, thereby proving the merits of admixing clinical anticipation with technology.<sup>[15]</sup> It is well known that risk assessment and scoring in ICU patients can improve patient outcomes. In a retrospective observational study on coronavirus disease (COVID)-19 patients on mechanical ventilation published in this issue of the Indian Journal of Anaesthesia (IJA), the applicability of nutrition risk in critically ill (NUTRIC) score was assessed. The study concludes that COVID-19 patients with acute respiratory distress syndrome and on mechanical ventilation were at nutritional risk and that a high NUTRIC score was associated with higher mortality<sup>[19]</sup>; nevertheless, it is likely that in the near future, CDSSs based on the NUTRIC score will be used to deliver real-time nutritional risk alerts to the intensivist caring for the critically ill COVID -19 patient, thus improving the quality of COVID-19 patient care and resultant outcomes. A scoping review found that CDSSs have positive impacts like improving work efficiency, providing more personal care, increasing confidence in making decisions and decreasing the number of ordered laboratory and medical imaging tests.<sup>[20]</sup>

Though we are harping on the advantages of CDSSs, these systems do have some disadvantages including several challenges and barriers to their design and implementation.<sup>[20]</sup> There are sporadic reports of unintended adverse clinical consequences from institutions that have implemented CDSSs.<sup>[21]</sup> In the perioperative arena, this could equvalate to a wrong CDSS alert given to a Postanaesthesia care unit (PACU) doctor to start a drug that the anaesthesiologist has not mentioned in the postoperative instructions leading to undesirable clinical consequences. Delay in data feeding, omission of data, wrong data entry and latency in data management can impact the decision-making.<sup>[22]</sup> Alert and alarm fatigue, clinical burnout and malfunction leading to stopping of alerts during monitoring, firing of spurious alerts and inappropriate drug alerts are other problems with CDSSs, which can probably enhance the morbidity and mortality particularly in critically ill patients<sup>[23]</sup>; nonetheless, more research on assessing the benefits and problems of CDSSs is needed.

The use of EHRs in the perioperative environment can facilitate accessibility of information of all patients in one location, improve communication of information among all personnel involved in the perioperative care, help adapt nursing interventions to the patients' needs and thereby enhance the quality of patient care in the operation theatre.<sup>[24]</sup> Electronic 'Sign out' and 'Hand-off' tools related to e-application (either stand-alone/integrated with EMRs) can be used to pass the surgical patient-specific information from one team of caregivers to the other team, for example from the preoperative room care group to the operating room group and later to the PACU/surgical ICU group.<sup>[12,24]</sup> The use of BCMA systems that integrate electronic medication administration records with barcode technology can prevent perioperative medication errors. Smart intravenous infusion pumps that are equipped with medication error-prevention software can also be used perioperatively to decrease medication errors. Anaesthesiologists can voluntarily report safety related incidents through the electronic perioperative incident reporting system.<sup>[12]</sup> Tagging and collocation of blood products with Radio-frequency identification chips is an upcoming technology that can help to check whether the blood product matches the blood type of the patient who is located within a predefined distance of the blood product. In case of mismatch, an alarm sounds and thus patient safety in perioperative blood transfusions can be enhanced.

In the current scenario of the COVID-19 pandemic, telemedicine has emerged as a new physician–patient interaction interface and can be used to facilitate patient–anaesthesiologist/surgeon communication both pre and postoperatively, monitor patients and track them efficiently. The preanaesthesia evaluation clinic, pain clinic, ICU and PACU are some areas wherein anaesthesiologists need to participate in multidisciplinary discussions. Synchronous telemedicine including real-time, two-way audio/video communication can prove useful in these areas. Tele-monitoring can help in ICU management in remote areas and this has already been used during the COVID-19 pandemic.<sup>[13,25]</sup>

Without a proper communication and feedback system, the utilisation of the technological advancements cannot be achieved optimally. Patient experience through e-feedback on the waiting time before surgery, preanaesthetic evaluation experience, intraoperative and postoperative experience and care can motivate and improve the perioperative care-givers' performance.<sup>[1]</sup>

## PERIOPERATIVE PATIENT SIMULATIONS

Simulation training is now no longer a novel technique and cannot be put in the same cohort as the newer health technological advancements. However, it is now an integral part of the regular undergraduate and postgraduate medical training in our country. Simulation training of perioperative team members in the management of perioperative life-threatening scenarios and multidisciplinary simulation training can improve communication, team work behaviour and attitudes, and this can definitely improve patient safety and the quality of perioperative care.<sup>[26]</sup>

## ENHANCED RECOVERY AFTER SURGERY (ERAS) PROTOCOLS

Similar to perioperative patient simulations, ERAS protocols are no longer novel, but their implementation is clouded by challenges. Perioperative ERAS protocols have been found to reduce the length of hospital stay and incidence of complications, thereby producing improved clinical outcomes in almost all surgical specialities.<sup>[27,28]</sup> Randomised controlled trials (RCTs) have shown that the use of surgical safety checklist and ERAS produce a significant reduction in perioperative morbidity and mortality.<sup>[29]</sup> However, the implementation of these tools in perioperative care is marred by barriers to their acceptance, adoption

and implementation, especially in countries like ours. Nevertheless, a previous editorial in the IJA has questioned whether ERAS will remain a distant speck on the horizon!<sup>[28]</sup> Another editorial, a national survey and a retrospective study on ERAS published in previous issues of the IJA have predicted that ERAS will soon create a paradigm shift in perioperative care.<sup>[27,29-31]</sup>

## E-TECHNOLOGY IN PERIOPERATIVE CLINICAL RESEARCH

EHRs have a potential to improve the efficiency of clinical trials. EHRs are currently accepted in clinical research for hypothesis generation, feasibility assessments, performance improvement and guideline adherence. Their role in patient recruitment, comparative effectiveness, health technology assessments, pragmatic trials and point-of-care randomisation is now emerging. They are widely used to assess health and drug utilisation, epidemiology and risk factors in observational studies and in postmarketing surveillance.<sup>[32]</sup> It has been forecasted that in the future, EHR data might become the standard resource for clinical research and that research studies using EHR data may equal or surpass prospective cohorts and RCTs as the primary resource for advancing evidence-based medicine.<sup>[33]</sup> In a multicentre pilot study published in this issue of the IJA, the authors have tried to assess the feasibility for planning a larger multicentric study at national level to find out the incidence and outcome of major neurological complications following central neuraxial block (CNB). They have concluded that a larger study is feasible.<sup>[34]</sup> This study throws up a volley of ideas. Could advanced e-tools like EMRs, Patient data management systems be used in this planned larger study to make data collection easier and complete? Would the routine use of CDSSs and Electronic incident reporting system by the anaesthesiologists of Aurangabad city have altered the incidence of the neurological complications following CNB? Will their use alter the nationwide incidence of post-CNB neurological complications?

This issue of the IJA has several articles related to postoperative complications and perioperative and intensive care outcomes.<sup>[19,34-36]</sup> These articles speak for themselves and strongly advocate for the implementation of newer strategies to enhance the quality of perioperative care and research. Countries like the United Kingdom have established

initiatives like the Perioperative Quality Improvement Programme, which is multidisciplinary. It collects and analyses data on the perioperative care of patients undergoing major non-cardiac surgery and measures complication rates, failure to rescue and patient reported outcomes.<sup>[37]</sup> It is time for us in India too, to take up such initiatives; nevertheless, developments are occurring at a good pace in the HIT landscape in our country. Different types of healthcare software are now emerging: healthcare management software, healthcare analytics software, medical diagnosis software, imaging and visualisation software, medical database software and medical research software. Indian companies are in tune with the production of this software (e.g., e-Sushrut, e-Swasthya, Megh-Sushrut, Srishti).<sup>[38]</sup> It is time for us to adapt this technology in modern perioperative care. Nonetheless, the perioperative quality improvement bandwagon is here, and it certainly promises to usher in a new era of high-quality perioperative care in our country.

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