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Perioperative registries in resource-limited settings: The way forward for Pakistan

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Perioperative registries in resource-limited settings: The way forward for Pakistan

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Abstract

Capable of improving surgical quality, perioperative registries can allow performance benchmarking, reliable reporting and the development of risk-prediction models. Well established in high-income countries, perioperative registries remain limited in lower- and middle-income countries due to several challenges. First, ensuring comprehensive data entry forums to power the registries is difficult because of limited electronic medical records requiring sustained efforts to develop and integrate these into practice. Second, lack of adequate expertise and resources to develop and maintain registry software necessitates the involvement of software developers and information technology personnel. Third, case ascertainment and item completion are challenging secondary to poor-quality medical records and high loss-to-follow-up rates, requiring telemedicine initiatives as an adjunct to existing care for the assessment of post-discharge outcomes. Lastly, standardised coding of clinical terminology is warranted for ensuring interoperability of the registries for which adaptation of the existing disease and procedural codes can be a sustainable and cost-effective alternative to the development of new codes.

Keywords: Perioperative care, Registries, Evidence-based practice, Quality improvement, Pakistan.

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Introduction

In the field of surgery, regularly assessing trends in incidence of major postoperative complications is essential globally. For this purpose, the development of perioperative registries (PORs) has proved to be a reliable and cost-effective approach.[1] PORs are high-quality datasets powered by sustained collaborations among multiple surgical facilities. These registries incorporate the findability, accessibility, interoperability and reusability (FAIR) principles of data management, allowing benchmarking of hospital performance, reliable reporting of postoperative outcomes, and development of risk-prediction models, collectively leading to improved quality of surgical care.[2-4]

In lower- and middle-income countries (LMICs), surgical facilities are burdened with inadequate quality of surgical care, owing to the challenges in building and maintaining surgical capacity in resource-constrained settings.[5] Compared to high-income countries (HICs), such resource-limited environments require more sophisticated and targeted surgical capacity-building initiatives, considering the greater potential for improvements in the quality of surgical care. While PORs have been well established in HICs, their implementation remains limited in LMICs, including Pakistan.[6]

The current review was planned to highlight the multifarious benefits of implementing perioperative registries in resource-constrained environments, such as Pakistan, to discuss the potential challenges that can hinder this process, and to suggest potential solutions which can be incorporated in LMICs.

Why the registries?

PORs are essential to facilitate improvement in the existing quality of surgical care, to allow continuous surveillance, and to promote surgical research (Figure).

The quality of surgical care plays a decisive role in the morbidity, mortality and quality of life (QOL) of patients undergoing surgery. However, there is very limited evidence available evaluating the quality of perioperative care (POC) in low-resource settings.[7] Research has shown that approximately 60% of avoidable deaths worldwide are secondary to low quality of care.[6] Therefore, particularly for LMICs such as Pakistan, efforts in improving access to healthcare cannot sufficiently translate into better health outcomes without improvement in the quality of care.[6,7]

Utilisation of PORs to improve patient safety and quality of care warrants a stepwise approach. First, the quality of

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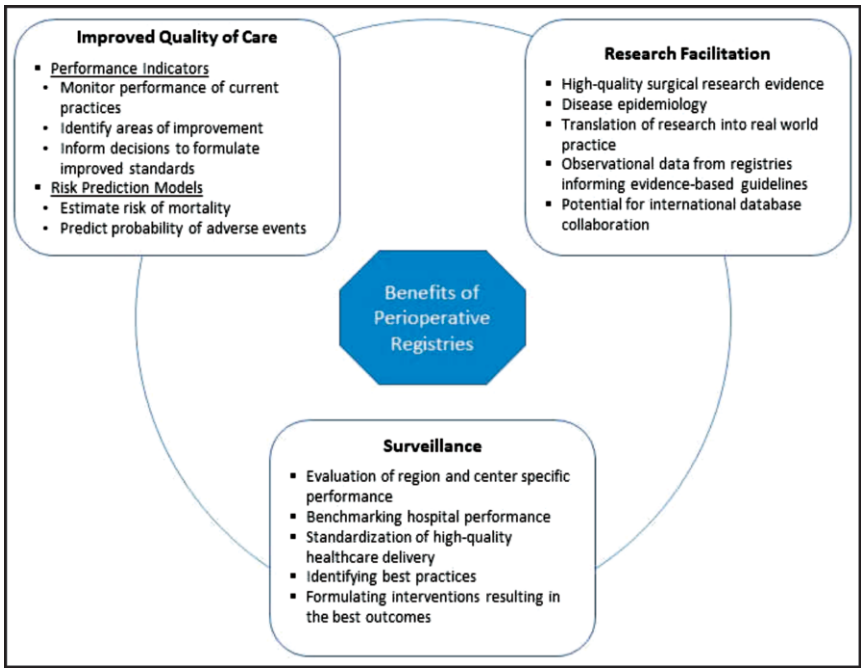

Figure: Potential benefits of implementing perioperative registries in Pakistan.

surgical care needs to be quantified using quality indicators. Ensuring that the selected quality indicators are both specific to assessing POC quality in an LMIC setting is imperative. Haller et al. identified several promising quality indicators that can be implemented as endpoints in the assessment of quality of surgical care even in resource-constrained settings. These included admission to the intensive care unit (ICU) within 14 days of surgery, length of hospital stay (LOS), surgical site infection (SSI), stroke, hospital readmission, and mortality within 30 days of index surgery.[8]

Second, the selected quality indicators need to be incorporated into hospital, regional, and national PORs in LMICs, including Pakistan. The data generated by these registries can subsequently allow the assessment of existing surgical practices and protocols, identify areas of improvement, and inform evidence-based decisions to ensure better quality of surgical care.[3,6,9,10] The National Surgical Quality Improvement Programme by the American College of Surgeons (ACS-NSQIP) is one of the most widely used PORs globally. Compared to the incidence rates in earlier years, participation in ACS-NSQIP has shown annual risk reduction of 0.8% for mortality, 3.1% for one or more morbidity events, and 2.2% for SSIs.[11]

Additionally, evidence from these registries can also facilitate the development of risk prediction models for adverse surgical outcomes. Such models consider the relevant risk factors and predict the probability of adverse events post-surgery for individual patients, informing surgical decision-making. An example of such a model is the risk calculator by the Society of Thoracic Surgeons (STS), powered by its national perioperative database.[12,13]

Furthermore, PORs also allow healthcare workers, medical governing bodies, and policymakers an avenue for continuous surveillance. Data from these registries can allow evaluation of regional and centre-specific performance along with enabling comparison of different surgical practices in hospitals. Such registries can facilitate benchmarking of hospital performance, thus allowing for standardisation of high-quality and efficient surgical POC in hospitals across Pakistan.[3,4]

Another advantage of PORs is research facilitation, particularly in a resource-constrained setting, like Pakistan. A majority of existing surgical research evidence in Pakistan is based on single-centre experiences with inadequate quality to inform surgical practice.[14] Consequently, evidence-based guidelines exist currently, but are usually powered by data extrapolated from HICs and upper-middle-income countries (UMICs).[15] Regional and national PORs can generate high-quality evidence specifically for the Pakistani setting, facilitating evidence-based surgery in the country.

In addition, data from established registries can be used to explore the trends in patient demographics and risk factors for adverse surgical outcomes over time.[16] This can facilitate research in disease epidemiology to gain better understanding and discern patterns of changing surgical indications in the population. PORs also provide an avenue to monitor the impact of different quality improvement interventions and guidelines using actual patient outcomes, demonstrating the translation of research into real-life practice.[4] Data from registry-based observational studies can also inform evidence-based guidelines in instances where clinical trials are not available.[16] With large datasets and subsequent integration, there is potential for national and international collaboration in research, combining the strengths of each individual database.[3]

Registries in Pakistan

In recent years, some surgeon-led collaborative approaches have successfully resulted in the

Table: Institutional, national and international perioperative registries functional in Pakistan.

Registries	Developed by	Patient Population	Data Sources	Quality Indicators
Institutional registries				
Karachi Trauma Registry (KITR)	Aga Khan University Hospital, Karachi National registries	All cases admitted to the emergency department of AKUH with a trauma history of less than 24 hours. Patients shifted to AKUH from other hospitals and having ICD injury codes of ICD-9-CM 800-959.9. Cases of isolated hip fractures, poisoning, and expiry on arrival are excluded.	Data is retrieved from patient medical records, such as doctors' and nurses' notes, laboratory and radiology reports, and discharge summaries. In addition, daily accounts of all ED visits are obtained from electronic data systems. These include information regarding patient demographics, primary reason for visit, and disposition. Data on patients with injuries is also captured from triage, admission, and ED discharge lists.	Delay in reaching hospital, length of stay in the emergency department, total length of stay in the hospital, discharge from emergency, predicted and actual survival.
National registries				
Pakistan Registry of Intensive CarE (PRICE)	PSCCM, ICS, and NICST	All planned and unplanned admissions in the five member ICUs from Karachi, Lahore, and Islamabad, having a total of 104 ventilated beds.	Similar to the NICST registry, the admission characteristics and diagnosis are recorded daily for each patient. Collaborating facilities report data at their own accord via a protected, cloud-based mobile/desktop portal that has been established by researchers and clinicians in Srilanka. Nominated local coordinators conduct weekly telephonic calls to obtain admission numbers from non-digitalized data within each ICU.	Mortality, quality of life
Pakistan National Joint Registry (PNJR)	Pakistan Arthroplasty Society (PAS) International registries	All patients undergoing arthroplasty surgery in implant companies and hospitals.	Case report forms, inform up forms, follow up form.	Adverse intraoperative events, postoperative weight bearing, implant details, and postoperative rehabilitative protocols.
International registries				
ACS-NSQIP	ACS	Patients undergoing surgery in all 700 hospitals that are in collaboration with NSQIP.	Data from preoperative management till 30 days postoperatively of randomly selected patients are collected prospectively by trained reviewers assigned by each hospital. Data are then entered on a web-based platform accessible 24 hours a day. Variables can vary between hospitals based on patient population, hospital characteristics, and focus of quality improvement. Blinded, risk-adjusted information is shared with all hospitals, allowing them to benchmark their complication rates and surgical outcomes.	30-day mortality, unplanned intubation, prolonged ventilator dependence (>48 hours), surgical site infections (superficial, deep, or organ/space), urinary tract infections, sepsis, septic shock, wound disruption, pneumonia, clostridium difficile colitis, delayed discharge (>30 days from principal procedure), unplanned reoperation(s), unplanned readmission(s), and hospital discharge destination.

ED: Emergency department, AKUH: Aga Khan University Hospital, ICU: Intensive care unit, PSCCM: Pakistan Society of Critical Care Medicine, ICS: Intensive Care Society, NICST: Network for Improving Critical Care Systems and Training, ACS-NSQIP: American College of Surgeons-National Surgical Quality Improvement Programme, ACS: American College of Surgeons.

implementation of a few institutional, national, and international PORs in Pakistan (Table). Among the institutional registries, a classic example is that of the Karachi Trauma Registry (KITR) established by the Aga Khan University Hospital (AKUH) in October 2009. KITR is a locally developed, electronic registry that utilises data from existing medical records at the hospital. KITR has been able to generate surveillance data, such as injury mechanisms and burden of severe injuries, quality indicators, such as length of stay in the emergency department (ED), injury-to-arrival delay, and injury severity, and survival probability.[17]

With regards to the national registries, the Pakistan Registry of Intensive Care (PRICE) and the Pakistan National Joint Registry (PNJR) are currently functional. PRICE is a contemporaneous registry developed by the Pakistan Society of Critical Care Medicine (PSCCM), Intensive Care Society (ICS) of the United Kingdom, and the Network for Improving Critical Care Systems and

Training (NICST). Being a clinician-led real-time registry, PRICE involves extensive collaboration between surgeons and administrative personnel involved in intensive care delivery, allowing the recruitment of ICUs from both public and private hospitals. Admission characteristics along with the diagnosis are documented for each admitted patient requiring intensive care. Data without any patient identifiers is displayed in control panels, facilitating the researchers to assess the trends in unit activity, severity of illness, bed occupancy and outcomes.[18]

PNJR is a voluntary project which has been conceived, designed, implemented and funded by the Pakistan Arthroplasty Society (PAS). Implant companies and hospitals can retrieve data from PNJR for conducting surgical research aimed at improving quality of care and safety for patients undergoing arthroplasties.[19]

Apart from the regional and national registries, Pakistan, being a resource-limited country, has not contributed significantly to the conception, design or implementation of any international POR. However, the AKUH has recently partnered with the ACS-NSQIP, contributing its patient data to this registry. ACS-NSQIP is a multi-institutional programme with currently 700 partnering hospitals worldwide. Trained surgical reviewers at each hospital collect data on numerous variables, including demographics, comorbidities, preoperative laboratory parameters, operative characteristics, and outcomes. ACS-NSQIP provides semi-annual reports to each hospital on the basis of the submitted data. This report benchmarks the performance of each hospital in comparison with the performance of an estimated average partnering ACS-NSQIP hospital performing the same procedures on the same patients. This allows hospitals to evaluate their performance compared to other partnering hospitals, driving continuous quality improvement initiatives.[20,21]

Despite these commendable efforts by the surgical community, the implementation of PORs remains limited in Pakistan. A majority of surgical facilities have not developed institutional registries and are not actively participating in national registries. Similarly, the ACS-NSQIP has not been implemented in most Pakistani hospitals. Considering the multifarious benefits of PORs, assessing the challenges involved in the implementation of these registries is imperative and can help identify the way forward for Pakistani surgical facilities.

Challenges and limitations in low-resource settings

Despite the commendable efforts by the surgical community, the number of PORs remains limited in Pakistan as is the case in other LMICs.[22] As highlighted earlier, there is a dire need for surgical registry data from low-resource settings to improve patient safety and to regulate surgical practices. However, a low-resource environment poses several challenges to the establishment of such PORs.

First, the process of development and plot implementation for a POR begins with the establishment of a uniform and comprehensive data entry forum. However, electronic medical records (EMRs) are currently lacking in resource-limited settings.[23] Implementation of EMRs warrants a higher cost of setup and maintenance in such settings, owing to poor existing infrastructure, frequent power outages, and network failures. Even in facilities that have implemented EMRs, utilisation mostly remains suboptimal secondary to the requirement of parallel data entry to paper and computer records, increasing the workload of already limited staff.[23-26] As a result, administrative data from EMRs is currently inadequate to power PORs in several settings, making the surgeons primarily responsible for capturing data related to patient care.[6] This situation warrants allocation of appropriate resources aimed at development and integration of sustainable administrative EMRs into the existing care to replace paper-based records. Such EMRs should also incorporate user-friendly software capable of continuous data synchronisation to safeguard data during potential power outages and network failures.

Second, PORs require efficient and secure software to power them. However, LMICs have limited expertise and resources for developing and maintaining appropriate registry software.[17] This can potentially be resolved with appropriate training, recruitment and integration of software developers and information technology (IT) personnel in the existing healthcare systems. This integration will also contribute to the generation of new jobs which can potentially improve employment rates across the LMICs.

Third, case ascertainment and item completion for PORs pose multifarious obstacles. Appropriate and carefully selected clinicodemographic characteristics, comorbidities, preoperative laboratory parameters, operative characteristics, and quality indicators need to be incorporated into the PORs.[17] However, data reporting and recording systems in most resource-constrained settings produce poor-quality data.[28] In a recent study in Tanzania, history of patients, daily progress notes, and daily surgeon orders were not included in 24%, 59% and 71% of the medical records, respectively.[29] In addition, the assessment of several surgical quality indicators

requires following patients post-discharge till the 30th day of index surgery.[8] The surgical population in LMICs experiences high loss-to-follow-up rates, ranging from 32% to 75%.[30,31] This situation necessitates the development of standardised EMRs to improve case completeness and implementation of telemedicine initiatives as an adjunct to existing surgical care for adequate assessment of quality indicators in the LMICs.[31,32] In addition, adequate and continuous training of administrative staff in data collection and development of comprehensive surgical checklists should be prioritised to improve data quality.

Lastly, when implementing PORs, it is essential to ensure the incorporation of the principle of interoperability.[2] This standardised system of health information exchange among collaborating surgical facilities warrants technical system design considerations described earlier in addition to uniform coding of clinical terminology.[33] For resource-limited settings, adaptation of existing disease and procedural codes, such as the International Classifications of Diseases (ICD) and Current Procedural Terminology (CPT) codes employed by the ACS-NSQIP, can be a more sustainable and cost-effective approach compared to the development of new codes.[20]

Conclusion

Establishing and implementing PORs is challenging in resource-limited environments, such as Pakistan. However, existing surgeon-led efforts have demonstrated that institutional and national bodies can collaborate and maintain PORs even in Pakistan. While these registries have been limited to a few partnering hospitals, they represent the first step towards a nationally representative Pakistani POR. Sustained contributions from the surgical community in Pakistan are needed to overcome the highlighted barriers and develop a data network capable of interpreting risk-adjusted surgical outcomes across the country. Such a network could not only promote evidence-based improvements in the quality of surgical care in Pakistan, but may also allow continuous surveillance, performance benchmarking and research facilitation.

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