

Original Article

Priorities for content for a short-course on postoperative care relevant for low- and middle-income countries: an e-Delphi process with training facilitators

The Postoperative Short Course Content Study group*

Summary

Most surgical and anaesthetic mortality and morbidity occurs postoperatively, disproportionately affecting low- and middle-income countries. Various short courses have been developed to improve patient outcomes in low- and middle-income countries, but none specifically to address postoperative care and complications. We aimed to identify key features of a proposed short-course addressing this topic using a Delphi process with low- and middle-income country anaesthesia providers trained as short-course facilitators. An initial questionnaire was co-developed from literature review and exploratory workshops to include 108 potential course features. Features included content; teaching method; appropriate participants; and appropriate faculty. Over three Delphi rounds (panellists numbered 86, 64 and 35 in successive cycles), panellists indicated which features they considered most important. Responses were analysed by geographical regions: Africa, the Americas, south-east Asia and Western Pacific. Ultimately, panellists identified 60, 40 and 54 core features for the proposed course in each region, respectively. There were high levels of consensus within regions on what constituted core course content, but not between regions. All panellists preferred the small group workshop teaching method irrespective of region. All regions considered anaesthetists to be key facilitators, while all agreed that both anaesthetists and operating theatre nurses were key participants. The African and Americas regional panels recommended more multidisciplinary healthcare professionals for participant roles. Faculty from high-income countries were not considered high priority. Our study highlights variability between geographical regions as to which course features were perceived as most locally relevant, supporting regional adaptation of short-course design rather than a one-size-fits-all model.

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Introduction

Globally, postoperative mortality is recognised as a leading cause of death [1]. The majority of mortality and morbidity in relation to surgery and anaesthesia occurs in the postoperative period, disproportionately affecting low- and middle-income countries (LMIC) [2–4]. Although postoperative complications are similar in type across

nations, their frequency and severity differ, possibly due to international differences in peri-operative care [5, 6]. A key component of this may be the lack of appropriately trained care providers [7, 8], related to variation in basic training programmes and the availability of postgraduate continuing education, especially for non-physician providers [9–11].

Recently, there has been increased interest in anaesthesia short courses to support providers in LMICs, including notably the initiative by the World Federation of Societies of Anaesthesiologists (WFSA) and the UK-based Association of Anaesthetists to develop the Safer Anaesthesia from Education (SAFE) courses. The SAFE courses focus on obstetric and paediatric anaesthesia [12], and are predominantly focused on pre- and intra-operative care. Follow-up from SAFE courses suggests that these improve skills, confidence and the teamwork abilities of participants [13–16]. More recently a multidisciplinary course on operating room care [17] has been developed by WFSA; the Association of Anaesthetists; Lifebox Foundation; Royal College of Surgeons of England; Association for Peri-operative Practice; and the Royal College of Obstetricians and Gynaecologists. While this course has one session on postoperative care, it centres around the immediate postoperative period only, predominantly dealing with care in the recovery room and handover to ward-based care. Short courses focused on intensive care in low-resource settings, for example BASIC-Low Resource [18], also touch on postoperative care. However, these emphasise identification and management of the critically ill patient, rather than general postoperative care; 'ability to rescue'; and reducing complication rates.

We could not identify any current short courses that include substantial content on the broader topics of postoperative care despite its importance for safe surgical care. There is a need to explore how, and by what means, it may be possible to bridge this gap. Therefore, the aims of this study were to collaborate with established SAFE course facilitators from LMICs to define key components of a proposed short-course on postoperative care and complications; explore preferred teaching formats to deliver such a short-course; and define participants and facilitators for this type of short-course.

Methods

Ethical approval was obtained from the Oxford Tropical Research Ethics Committee. We chose the Delphi process as a systematic method to determine agreement on a topic through consecutive interactive rounds attended by a panel of experts where participation is anonymous, removing the effect of status [19, 20]. This technique has previously been found to be effective in curriculum development [21, 22]. We modified the classical Delphi process in three ways to improve geographical reach and expert involvement: the exploratory phase, Delphi process and triangulation phase were undertaken fully online; it was possible for eligible participants to join in any Delphi round; and triangulation of

the findings was completed using a website with the option to leave feedback. The study is reported in line with recommendations from the conducting and reporting of Delphistudies guidance [23]. We collected and managed study data using REDCap (Vanderbilt University, Nashville, TN, USA) and electronic data-capture tools hosted by the University of Oxford (Oxford, UK) [24, 25]. As per the recently published consensus statement on measures to promote equitable international partnerships [26], we have provided a reflexivity statement in online Supporting Information Appendix S1.

The expert panel was drawn from the pool of SAFE faculty based in LMICs who had taught on SAFE obstetric and paediatric courses supported by the WFSA. When the study started, this pool constituted 868 anaesthesia providers across 45 countries in four different geographical regions. They were invited to join the panel by the WFSA via emails and social media. We aimed to recruit 10 or more panellists from each geographical region. If the number was <10 in the first round, we planned to combine the region with the nearest geographical region.

To prepare our preliminary question, we conducted a literature search for key studies detailing postoperative morbidity and mortality in LMICs and qualitative research on patient experience of surgery in LMICs. Additionally, we included content of relevance to postoperative care; teaching techniques; participants; and facilitators listed in different SAFE course manuals and the BASIC-Low Resource course manual [27–30]. Subsequently, we undertook exploratory focus groups in English with SAFE facilitators based in LMICs. These were grouped according to WHO geographical regions. We used this approach to triangulate data from the literature with the experience and views of practising anaesthesia providers familiar with the short-course format. The topic guide is available in online Supporting Information Table S1. The input from the exploratory focus groups was used to add new items to the survey. Together with the focus groups, we piloted the layout and wording of the preliminary survey to ensure the content was clear and easy to follow.

Three rounds of questionnaires were completed. Panellists were invited to join the first panel in February 2021, and each round was available in English, Spanish and French. For each item in the questionnaire, the panellists were asked to indicate, using a 4-point Likert scale, if they would definitely not include; probably not include; probably include; or definitely include the item on a short-course on postoperative care and complications. In the first round, the panellists were encouraged to suggest new items in line with standard Delphi processes. We grouped

the responses according to the WHO geographical regions: African region (AFR); the Americas region (AMR); south-east Asian region (SEAR); and Western Pacific region (WPR). Due to limited participants from the Western Pacific Region, the panel was merged with the south-east Asian region panel from round 1 onwards (SEAR/WPR).

In the second round, we included new items suggested to all panels, and the questionnaire was re-advertised. Additionally, based on suggestions and feedback, some items were reworded or accompanied by explanatory notes. As in round 1, the experts were asked to rate each item. In the first and second rounds, panellists were asked if their response regarding use of remote teaching would be different if resources were unlimited. For the third and final rounds, for each item the panellists were shown the proportion of responses that said to 'definitely include' it. With this information in mind, we asked the panellists to indicate with a binary yes/no which items were most important to include on a short-course. Finally, the short-course content was grouped by topic into five subcategories, and panellists were asked to rank them in the order of importance.

The Delphi process ran from February to May 2021. As per protocol, we invited the focus group participants to join the study group after conclusion of the Delphi process to participate in interpreting the findings, preparing the manuscript for publication and sharing the findings with their regional networks. To increase the reliability of the findings with a wider readership outside the eligibility criteria, the findings from round 3 of the e-Delphi process for each geographical region was summarised and placed on a website [31]. We asked visitors to provide anonymous feedback on the findings. We sent out invitations for feedback via social media and the personal networks of the study group, as well as targeted invitations to members of the WFSA Education Committee and SAFE steering group, many of whom are involved with the development of short-course materials. This process finished in July 2021.

The frequency of responses for each point on the Likert scale was calculated. We included items in the next iteration of the survey according to the following pre-specified criteria: Round 1, an item was ranked 3 or 4 (probably or definitely include) by 50% or more of the experts; and Round 2, an item was ranked 4 (definitely include) by 70% or more of the experts.

Due to a low response rate in the AFR in round 2, we made a post-hoc definition for this region where an item would be included in round 3 if it was ranked 4 by 64% or more of the panel. Online Supporting Information Table S2

shows how round 3 would have looked for the AFR with and without the protocol deviation.

In keeping with the aim of identifying key components for a short-course rather than seeking consensus, we did not define a criterion for consensus. Instead, following round 3, we showed the percentage of agreement for each item that made it through the Delphi process for each of the panels. We calculated mean and standard deviation (SD) for the five subcategories of course content to rank them in the order of importance. Data analysis was undertaken using R 4.0 (R Foundation, Vienna, Austria).

To reduce the environmental impact of this global study, communication was conducted entirely remotely, using WhatsApp, online survey tools and a website. Based on available evidence [32–34], the estimated carbon dioxide equivalents of internet traffic through digital servers were approximated and offset through the United Nations carbon offset platform.

While not included in the carbon offset, there is potential for the findings of this study to be used in the development of further short-course materials. Therefore, there is potential for a considerable impact especially if travel is required for the presence of facilitators. We would encourage course developers and facilitators to take this into account and reduce long distance travel as much as possible and carbon offset where travel is required. WFSA, who are partners in this study, are committed to carbon offsetting travel required for courses run by them as part of their travel policies.

Results

Figure 1 shows the stages of the Delphi process, including the preparatory phase. A total of 108 items were entered into the first round. A further 11 items suggested by the experts in the first round were incorporated and rated in the second round of all geographical region panels. The full results from all three rounds can be seen in online Supporting Information Table S3.

Out of an eligible 868 experts, 86 (10%), 64 (7%) and 35 (4%) participated in rounds 1, 2 and 3, respectively. Most panellists were certified specialist physician anaesthesia providers (between 88% and 97% across all rounds), experienced in delivery of short courses (> 50% had taught on two or more courses in each round). Of those who responded in the final round, 19 (54%) had been involved in all 3 rounds. More detailed characteristics of the expert panel can be found in online Supporting Information Table S4. The website with the round 3 results had 201 page views from 10 different countries. We received

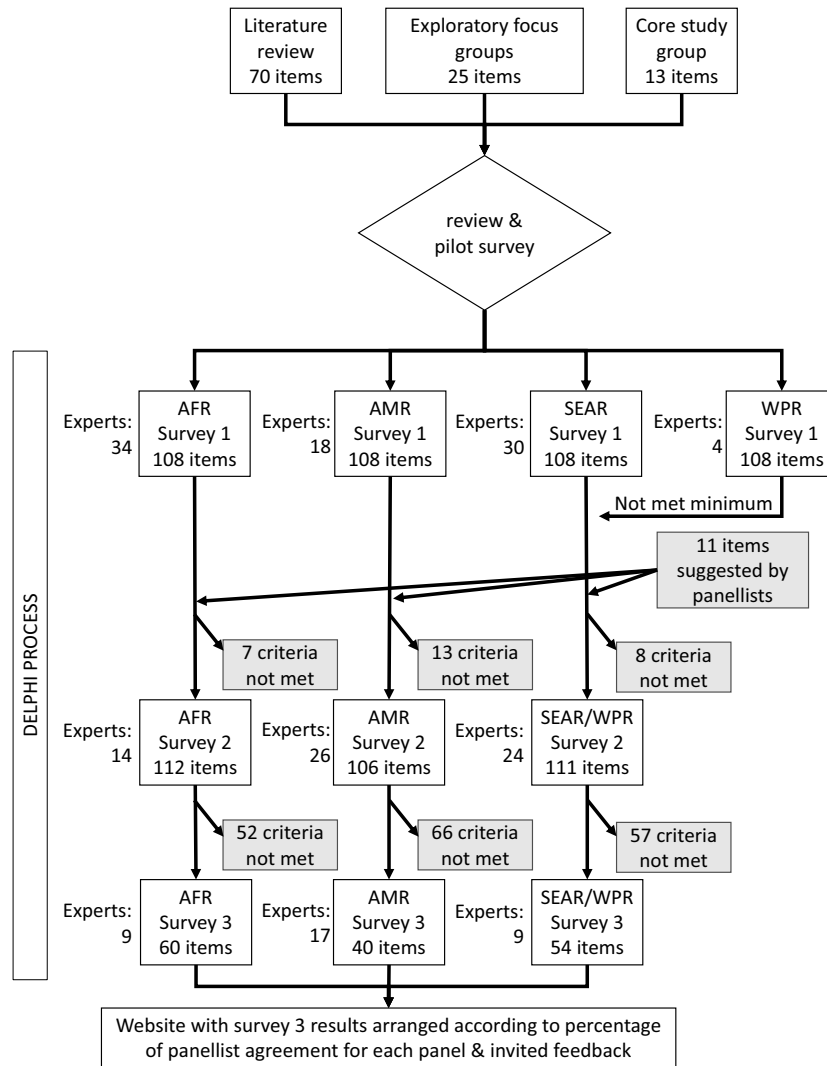


Figure 1 Flow chart showing the stages of the Delphi process. AFR, African region; AMR, the Americas region; SEAR, south-east Asian region; WPR, Western Pacific region.

feedback from 10 individuals, 9 of whom had previously been involved with short-course curriculum development.

Items relating to content on a potential short-course represented 59 out of 108 (55%) items in the first round, and 9 out of the 11 items added following suggestions by the experts fell in this category. The course content was grouped into five themes according to their focus for the third round:

- Patient and health system considerations before surgery
 - Anaesthesia and surgical care during surgery
 - Common complications after surgery
 - Monitoring of the patient after surgery
 - ‘Ability to rescue’ the patient with surgical complications
- Across all regions, panellists indicated most items on

‘common complications’ should be included on a short-course (13 out of 13 in both AFR and SEAR/WPR and 9 out of 13 in AMR), while panellists felt fewer items should be included under postoperative monitoring (8 out of 16 in AFR, 5 out of 16 in SEAR/WPR and 2 out of 16 in AMR) and ‘patient considerations before surgery’ (3 out of 8 in AFR, 2 out of 8 in SEAR/WPR and 3 out of 8 in AMR). Across all themes, multiple items were identified as vital for inclusion on a short-course by all round 3 panellists in the respective regions (21 out of 45 items in AFR, 27 out of 36 in SEAR/WPR and 7 out of 26 in AMR). In terms of identifying the most important themes to focus on for a short-course, AFR panellists listed common complications after surgery highest (mean (SD) 2.22 (0.83)), while SEAR/WPR panellists

had monitoring of the patient after surgery highest mean (SD) 2.56 (1.01) and AMR panellists listed intra-operative topics mean (SD) 2.18 (0.95). All regions had pre-operative topics as the least important focus. Course content felt to be most important to include, reported by 70% or more of panellists in round 3, is listed in Figure 2. The preferred duration for a short-course on this topic was 4–7 days according to AFR panellists, while AMR and SEAR/WPR panellists preferred 2–3 days.

Items relating to methods and conduct of teaching represented 18 out of 108 (17%) items in the first round, and no further items in this category were added in the second round. Across all regions, small group workshops were identified as the most suitable method of teaching (100% of panellists in AFR and SEAR/WPR and 88% in AMR), with most 'online only' methods either removed following second round (1 out of 6 kept in AFR and SEAR/WPR and 3 out of 6 kept in AMR), or ranked low in the third round. Resource availability could be a reason for this, as panellists reported they would have given a different response in the first and second round if resources had been unlimited (71% and 79% of AFR panellists, 44% and 50% of SEAR/WPR panellists and 61% and 65% of AMR panellists, respectively). Teaching methods reported by 70% or more of panellists in round 3 to be most important to include are listed in Fig. 3.

In the first round, items relating to participants and facilitators represented 13 out of 108 (12%) and 18 out of 108 (17%), respectively, and one item was added to both for the second round. Considering participants, all regions agreed physician anaesthetists and operating theatre nurses were key. Additionally, the SEAR/WPR panel identified critical care nurses as key, the AMR panel identified surgeons, while the AFR panel identified both of these as well as non-physician anaesthesia providers; anaesthesia technicians; and non-specialist operative surgical providers. Considering facilitators, panellists across all regions found physician anaesthetists to be most important (100% in all panels), while AFR and SEAR/WPR would also include surgeons. International faculty from high-income countries was included in the first round based on input from the exploratory focus groups. However, this faculty group only met inclusion criteria for round 3 in the AFR panel, where they were considered important by only 44% of experts. National faculty was important to 100% of SEAR/WPR experts, while faculty from the wider region, other LMICs and national were listed as important by 100%, 82% and 76% of the AMR panel, respectively. Participants and facilitators reported by 70% or more of panellists in round 3 to be most important to include are listed in Fig. 4.

Discussion

Through three parallel online Delphi processes, we engaged with experts based in LMICs across the globe to identify key course content; preferred teaching methods; and important participants and facilitators for a short-course on postoperative care. To the best of our knowledge, this is the first time this process has been used to define components of a short-course for use globally. We used hybridised remote communication tools to deliver the study and found that this was feasible, inexpensive and enabled wider engagement across multiple geographical regions with minimal environmental impact.

We found that while there was a high level of agreement within the individual round 3 panels as to what content was key and what themes were most important, there were distinct and substantial differences between regional panels. Our study highlights the difficulties that may exist in trying to devise a single curriculum to be used across a very heterogeneous group of countries where surgical and anaesthetic care may differ from the point when patients first engage with the health system. This suggests that to maximally benefit the intended practitioners and their patients, the content of this type of short-course should be guided by their specific needs relevant to the location where the course is being held rather than by a universal curriculum. A universal curriculum has been implemented with other widely available short courses such as the SAFE courses, although the SAFE obstetrics course has one session (out of 10) where the local team can select a module, with options including 'anaemia and malaria in pregnancy' [27].

Differences between regions were also apparent in the proposed 'target audience' for training in postoperative care. We are not aware of any existing research addressing who should be involved as participants or facilitators in training for this topic. Considering the many disciplines that may be involved in patient care after surgery, it could be considered that a short-course should be aimed at 'all members of the postoperative care journey'. However, panellists from different regions identified varied key participants, with those from the AFR reflecting the broadest range of team members. This is likely to be related to the regional differences in course topic preference (e.g. if the course content is focused on in-theatre topics, the involvement of ward nurses as participants might be a lower priority). Had we asked panellists to identify important faculty and participants after key course content was identified, this relationship might have been clearer. Further work to explain the regional differences might also examine

		AFR (n = 9)	AMR (n = 17)	SEAR/WPR (n = 9)
PATIENT AND HEALTH FACILITY	Age related concerns	8 (89%)	17 (100%)	9 (100%)
	Care standards guidelines	9 (100%)	17 (100%)	8 (89%)
	Delays to reaching surgical care	9 (100%)	N/A	N/A
	Levels of care after surgery	7 (78%)	N/A	N/A
	prognosis informing surgery	9 (100%)	17 (100%)	N/A
	Short term health issues	9 (100%)	N/A	9 (100%)
	Staff wellbeing and resilience	N/A	13 (76%)	N/A
INTRAOPERATIVE	Anaesthesia providers	7 (78%)	N/A	N/A
	Anaesthetic complications	9 (100%)	17 (100%)	9 (100%)
	Anaesthetic technique	9 (100%)	16 (94%)	9 (100%)
	Availability of anaesthesia drugs, oxygen, and equipment	9 (100%)	13 (76%)	8 (89%)
	Severity of surgery	7 (78%)	14 (82%)	9 (100%)
	Surgical complications	9 (100%)	17 (100%)	9 (100%)
	Surgical technique	8 (89%)	15 (88%)	8 (89%)
	Type of surgery	7 (78%)	14 (82%)	9 (100%)
	Urgency of surgery	8 (89%)	13 (76%)	9 (100%)
COMPLICATIONS	Altered biochemistry	9 (100%)	N/A	9 (100%)
	Blood related	9 (100%)	17 (100%)	9 (100%)
	Cardiovascular	9 (100%)	17 (100%)	9 (100%)
	Complications in particular specialties	9 (100%)	14 (82%)	7 (78%)
	Complications of ICU stay	7 (78%)	N/A	7 (78%)
	Gastrointestinal	7 (78%)	N/A	9 (100%)
	Infection	9 (100%)	14 (82%)	9 (100%)
	Management of nausea and vomiting	9 (100%)	15 (88%)	9 (100%)
	Management of pain	9 (100%)	14 (82%)	9 (100%)
	Neurological	7 (78%)	14 (82%)	9 (100%)
	Renal	9 (100%)	14 (82%)	9 (100%)
	Respiratory	9 (100%)	15 (88%)	9 (100%)
MONITORING	Basic monitoring	9 (100%)	15 (88%)	9 (100%)
	Common diagnostic testing	8 (89%)	N/A	9 (100%)
	Early warning scores	9 (100%)	14 (82%)	9 (100%)
	Hand-over	9 (100%)	N/A	9 (100%)
	Nursing availability and level of training	8 (89%)	N/A	N/A
	Role of physiotherapy	N/A	N/A	9 (100%)
'ABILITY TO RESCUE'	Ability to escalate care	N/A	N/A	8 (89%)
	Blood bank availability	N/A	N/A	7 (78%)
	Capacity to manage acute pain	9 (100%)	15 (88%)	9 (100%)
	Referral and transfer	9 (100%)	N/A	9 (100%)
	Resource availability for higher level of care	N/A	N/A	7 (78%)
	Resuscitation and cardiac arrest	8 (89%)	17 (100%)	9 (100%)
	Unplanned return to theatre	N/A	N/A	100

Figure 2 Course content items reported by 70% or more of panellists in round 3 to be most important for each of the three panels. Items are grouped in their subthemes and listed alphabetically. Values are number (proportion) of panellists identifying the item as important. AFR, African region; AMR, the Americas region; N/A, content not included in that region; SEAR/WPR, south-east Asian and Western Pacific regions. Full list of items included in round 3 is available in online Supporting Information Table S3.

the correlation of proposed participant and faculty groups (as well as course content) with the availability of local or regional data on the most common or severe postoperative problems.

The low importance by panellists in all regions on involving international faculty from high-income countries suggests that a shift from current common models of short-course delivery such as SAFE (which frequently make use of

visiting high-income country faculty when starting in new locations) may be appropriate. While the role of high-income country educators was not the primary focus of this study, future research might valuably examine the reasoning behind the low importance apportioned to this potential faculty, and, more importantly, how to support and increase local/national/regional faculty with or without remote assistance. Such a shift could potentially have a

	AFR (n = 9)	AMR (n = 17)	SEAR/WPR (n = 17)
IN-PERSON – High fidelity simulation	8 (89%)	13 (76%)	N/A
IN-PERSON or REMOTE - Discussion group	7 (78%)	N/A	N/A
IN-PERSON or REMOTE - Short case studies	N/A	15 (88%)	8 (89%)
IN-PERSON or REMOTE - Small group workshops	9 (100%)	15 (88%)	9 (100%)
IN-PERSON or REMOTE -Multiple choice questions	N/A	N/A	7 (78%)
REMOTE - Online forum discussions WITH facilitator	N/A	N/A	7 (78%)
REMOTE - Pre-recorded presentations	N/A	12 (71%)	N/A
REMOTE - Written material	N/A	14 (82%)	N/A

Figure 3 Teaching methods reported by 70% or more of panellists in round 3 to be most important for each of the three panels. Methods are listed alphabetically. Values are number (proportion) of panellists identifying the method as important. AFR, African region; AMR, the Americas region; N/A = method not included in that region; SEAR/WPR, south-east Asian and Western Pacific regions. Full list of teaching methods included in round 3 is available in online Supporting Information Table S3.

		AFR (n = 9)	AMR (n = 17)	SEAR/WPR (n = 9)
FACULTY	Faculty from neighbouring countries	N/A	17 (100%)	N/A
	Faculty from other LMICs	N/A	14 (82%)	N/A
	National faculty	N/A	13 (76%)	9 (100%)
	Physician anaesthesia specialist providers	9 (100%)	17 (100%)	9 (100%)
	Specialist operative surgical providers	8 (89%)	N/A	N/A
PARTICIPANTS	Anaesthesia technicians (or operating department practitioners, ODPs)	7 (78%)	N/A	N/A
	Non-Physician anaesthesia providers	9 (100%)	N/A	N/A
	Non-specialist operative surgical providers	8 (89%)	N/A	N/A
	Nurses (critical care)	8 (89%)	N/A	9 (100%)
	Nurses (operating theatre and recovery)	9 (100%)	15 (88%)	9 (100%)
	Physician non-specialist anaesthesia providers	9 (100%)	N/A	N/A
	Physician specialist anaesthesia providers	7 (78%)	17 (100%)	N/A
	Specialist operative surgical providers	8 (89%)	14 (82%)	N/A

Figure 4 Facilitators and participants reported by 70% or more of panellists in round 3 to be most important for each of the three panels. They are listed alphabetically. Values are number (proportion) panellists identifying them as important. AFR, African region; AMR, the Americas region; LMICs, low- and middle-income countries; N/A, facilitator or participant not included in that region; SEAR/WPR, south-east Asian and Western Pacific regions. Full list of facilitators and participants included in round 3 is available in online Supporting Information Table S3.

significant impact on relevance, ownership and teaching capacity, not to mention reducing the financial cost and major environmental impact of long-haul flights for visiting staff.

With regard to the mode of course delivery, digital course delivery modes were considered. Many synchronous and asynchronous learning resources in medicine and surgery are now available, accelerated by the urgency of the COVID-19 pandemic [35], including the obstetric and paediatric SAFE short courses [36], and some evidence is emerging that a shift to online teaching may improve access for LMIC participants [37]. In the preparatory phase, exploratory focus groups described possible barriers for effective online learning including reliable internet connection; cost of mobile data; availability of access devices; difficulty staying engaged; and unfamiliarity. The

lack of hands-on skill-based teaching was also highlighted as a reason why online teaching could not fully meet the needs for such a short-course. Panellists identified a preference for small group workshops across all regions. However, further investigation would be beneficial to establish exactly what aspects of small group workshops are most important (e.g. hands-on skill development; active participation; and/or group dynamics), and whether this result reflects primarily the view of the facilitator (which all panellists were) or the participant (which all panellists had once been) or both.

There are important limitations to consider when looking at the findings. First, our decision to focus on established faculty trained in a specific short-course template inherently limited the scope to anaesthesia providers, whereas postoperative care is multidisciplinary.

We chose to focus on this group for pragmatic reasons. The WFSA has a well-established network among SAFE facilitators involved in its courses, so given the constraints of conducting the study during a pandemic we felt we would get the best overview and engagement from this group. Nevertheless, we found there was a low response rate from the potential pool of experts with dropouts between each stage. This could in part be explained by web-based surveys having reduced response rates compared with other methods. [38] Additionally, the COVID-19 pandemic was peaking in several countries during the course of the study, which was particularly the case for the final round (taking place during April–May 2020). We tried to mitigate for this by extending the recruitment period for the final round. Second, we did not define in advance what timeframe ‘postoperative care and complications’ covered, whether it was only immediately following surgery or whether it was until full rehabilitation in the community. This allowed a broad interpretation of the questions by participants and avoided constraining individual responses to fit a predetermined model which might not have reflected local views. However, it may also have contributed to lack of clarity on the content and participant make-up, which could account for some of the regional disparity (though all were asked identical questions).

We have made several research recommendations to determine the most useful way to offer training in postoperative care to health providers in low-resource settings. Our findings also suggest ways in which a short-course in postoperative care could now be developed based on the views of experienced facilitators from LMICs. Some content topics were agreed on consistently across regions, for example intra-operative anaesthetic and surgical complications (see Fig. 2). These might form the basis of a set of short-course modules which local leaders (e.g. national nursing or medical membership organisations) could develop to maximise applicability to their specific context (potentially in partnership with national or international institutions experienced in short-course development, who could provide a repository for the template and/or locally developed modules). The development of multiple modules to choose from rather than a fixed curriculum would allow local facilitators to create courses of varying length depending on need, interest and resource availability. An example of a short-course that has enabled this approach is the modular version of the Primary Trauma Course, which originally was a 2-day course to train medical professionals in the management of trauma patients in low-resource settings. Based on feedback from experienced faculty, a modular

version with 10 standalone modules was created and has been piloted in Kenya and Madagascar. [39] However, while local faculty is encouraged to create context-specific scenarios for use on the course, the current available library of modules has remained the same. Meanwhile, a modular library for a postoperative short-course could potentially continue to increase as the evidence around postoperative care in different settings expands (e.g. enhanced recovery after surgery (ERAS) concepts, which were not included in this study, but for which primary data are emerging in the LMIC context) [40]. Similarly, as fuller data emerge on peri-operative risk in LMICs at national, regional and local levels, this should inform the contextualisation of training to best address local need.

In summary, this study provides an outline of key content to consider when developing a short-course on postoperative care and complications, and highlights that perceived importance differs between geographical regions. We propose that a shift in curriculum development towards more targeted, customisable and locally relevant course content may therefore be appropriate.

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References

1. Nepogodiev D, Martin J, Biccard B, et al. Global burden of postoperative death. *Lancet* 2019; **393**: 401.
2. Coetzee E, Biccard BM, Dyer RA, Meyersfeld ND, Chishala C, Mayosi BM. Incidence of myocardial injury after non-cardiac surgery: experience at Groote Schuur hospital, Cape Town, South Africa. *South African Medical Journal* 2018; **108**: 408.
3. Bhangu A, Fitzgerald JEF, Fergusson S, et al. Mortality of emergency abdominal surgery in high-, middle- and low-income countries. *British Journal of Surgery* 2016; **103**: 971–88.
4. Nepogodiev D, Bhangu A, Glasbey JC, et al. Mortality and pulmonary complications in patients undergoing surgery with

- perioperative SARS-CoV-2 infection: an international cohort study. *Lancet* 2020; **396**: 27–38.
5. Biccard BM, Madiba TE, Kluyts H-L, et al. Perioperative patient outcomes in the African surgical outcomes study: a 7-day prospective observational cohort study. *Lancet* 2018; **391**: 1589–98.
 6. Pearse RM, Clavien PA, Demartines N, et al. Global patient outcomes after elective surgery: prospective cohort study in 27 low-, middle- and high-income countries. *British Journal of Anaesthesia* 2016; **117**: 601–9.
 7. Holmer H, Lantz A, Kunjumen T, et al. Global distribution of surgeons, anaesthesiologists, and obstetricians. *Lancet Global Health* 2015; **3**: S9–11.
 8. Kempthorne P, Morriss WW, Mellin-Olsen J, Gore-Booth J. The WFSA global anesthesia workforce survey. *Anesthesia and Analgesia* 2017; **125**: 981–90.
 9. Edgcombe H, Baxter LS, Kudsk-Iversen S, Thwaites V, Bulamba F. Training non-physician anaesthetists in sub-Saharan Africa: a qualitative investigation of providers' perspectives. *British Medical Journal Open* 2019; **9**: e026218.
 10. Law TJ, Bulamba F, Ochieng JP, et al. Anesthesia provider training and practice models. *Anesthesia and Analgesia* 2019; **129**: 839–46.
 11. Kudsk-Iversen S, Shamambo N, Bould MD. Strengthening the anesthesia workforce in low- and middle-income countries. *Anesthesia and Analgesia* 2018; **126**: 1291–7.
 12. World Federation of Societies of Anaesthesiologists. Safer anaesthesia from education (SAFE). <https://wfsahq.org/our-work/education-training/safe-training> (accessed 05/01/2022).
 13. White MC, Rakotoarisoa T, Cox NH, Close KL, Kotze J, Watrous A. A mixed-method design evaluation of the SAFE obstetric Anaesthesia course at 4 and 12–18 months after training in the republic of Congo and Madagascar. *Anesthesia and Analgesia* 2019; **129**: 1707–14.
 14. Boyd N, Sharkey E, Nabukenya M, et al. The Safer Anaesthesia from Education (SAFE)® paediatric anaesthesia course: educational impact in five countries in East and Central Africa. *Anaesthesia* 2019; **74**: 1290–7.
 15. Lilaonitkul M, Mishra S, Pritchard N, et al. Mixed methods analysis of factors influencing change in clinical behaviours of non-physician anaesthetists in Kenya following obstetric anaesthesia training. *Anaesthesia* 2020; **75**: 1331–9.
 16. Moore JN, Morriss WW, Asfaw G, Tesfaye G, Ahmed AR, Walker IA. The impact of the Safer Anaesthesia from Education (SAFE) obstetric Anaesthesia training course in Ethiopia: a mixed methods longitudinal cohort study. *Anaesthesia and Intensive Care* 2020; **48**: 297–305.
 17. THET. SAFE operating room course. <https://www.thet.org/safe-operating-room-course> (accessed 11/05/2020).
 18. Gomersall C. BASIC for developing healthcare systems. 2018. <https://www.aic.cuhk.edu.hk/web8/BASICDHS.htm> (accessed 26/08/2020).
 19. Dalkey N, Helmer O. An experimental application of the DELPHI method to the use of experts. *Management Science* 1963; **9**: 458–67.
 20. Thangaratinam S, Redman CW. The Delphi technique. *Obstetrician and Gynaecologist* 2005; **7**: 120–5.
 21. Fang M, O'Glasser A, Sahai S, Pfeifer K, Johnson KM, Kuperman E. Development of a nationwide consensus curriculum of perioperative medicine: a modified Delphi method. *Perioperative Care Operative Room Management* 2018; **12**: 31–4.
 22. Sitlington HB, Coetzer AJ. Using the Delphi technique to support curriculum development. *Education and Training* 2015; **57**: 306–21.
 23. Jünger S, Payne SA, Brine J, Radbruch L, Brearley SG. Guidance on conducting and REporting DELphi studies (CREDES) in palliative care: recommendations based on a methodological systematic review. *Palliative Medicine* 2017; **31**: 684–706.
 24. Harris PA, Taylor R, Minor BL, et al. The REDCap consortium: building an international community of software platform partners. *Journal of Biomedical Informatics* 2019; **95**: 103208.
 25. Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG. Research electronic data capture (REDCap)—a metadata-driven methodology and workflow process for providing translational research informatics support. *Journal of Biomedical Informatics* 2009; **42**: 377–81.
 26. Morton B, Vercueil A, Masekela R, Heinz E, Reimer L, Saleh S, et al. Consensus statement on measures to promote equitable authorship in the publication of research from international partnerships. *Anaesthesia* 2022; **77**: 264–76.
 27. Association of Anaesthetists, World Federation of Societies of Anaesthesiologists. SAFE Obstetric Anaesthesia Course - Participant Manual. 3rd edn. 2018.
 28. Association of Anaesthetists, World Federation of Societies of Anaesthesiologists, Royal College of Surgeons of England, Association for Perioperative Practice, Royal College of Obstetricians and Gynaecologists, Lifebox Foundation. SAFE Operating Room Course - Participant Manual, 2nd edn. London: WFSA; 2019.
 29. Association of Anaesthetists, World Federation of Societies of Anaesthesiologists. SAFE Paediatric Anaesthesia Course - Participant Manual. London: Association of Anaesthetists; 2017.
 30. Mossenson A, Mukwesi C, Livingston P. Vital Anaesthesia Simulation Training - Facilitator Handbook. Australia: Dalhousie University; 2018. <https://vastcourse.org/facilitator-materials>.
 31. OxSTAR. Post-operative short course content study. <https://www.oxstar.ox.ac.uk/research/postoperative-short-course-content-study> (accessed 05/01/2022).
 32. ClimateCare. Climate+Care Infographic: the carbon footprint of the internet. <https://climatecare.org/infographic-the-carbon-footprint-of-the-internet> (accessed 27/08/2020).
 33. Cook G, Lee J, Tsai T, et al. Clicking Clean: Who is Winning the Race to Build a Green Internet? Washington, DC: Greenpeace. 2017. <https://www.greenpeace.org/international/publication/6826/clicking-clean-2017/>.
 34. Website Carbon Calculator. How is your website impacting the planet? <https://www.websitecarbon.com> (accessed 27/08/2020).
 35. Dedeilia A, Sotiropoulos MG, Hanrahan JG, Janga D, Dedeilias P, Sideris M. Medical and surgical education challenges and innovations in the COVID-19 era: a systematic review. *In Vivo (Brooklyn)*. 2020; **34**: 1603–11.
 36. World Federation of Societies of Anaesthesiologists. Renowned SAFE training course goes digital. 2021. <https://wfsahq.org/news/latest-news/renowned-safe-training-course-goes-digital> (accessed 22/11/2021).
 37. Jain R, Carneiro RAVD, Vasilica A-M, et al. The impact of the COVID-19 pandemic on global neurosurgical education: a systematic review. *Neurosurgical Review* 2021. Epub 8 October. <https://doi.org/10.1007/s10143-021-01664-5>.
 38. Sammut R, Griscti O, Norman IJ. Strategies to improve response rates to web surveys: a literature review. *International Journal of Nursing Studies* 2021; **123**: 104058.
 39. Primary Trauma Care Foundation. Modular PTC Training. Oxford: Primary Trauma Care Foundation. 2018. <https://www.primarytraumacare.org/get-involved/download-resources>
 40. Oodit R, Biccard B, Nelson G, Ljungqvist O, Brindle ME. ERAS society recommendations for improving perioperative care in low- and middle-income countries through implementation of existing tools and programs: an urgent need for the surgical safety checklist and enhanced recovery after surgery. *World Journal of Surgery* 2021; **45**: 3246–8.

Appendix 1. Postoperative Short Course Content Study group

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Supporting Information

Additional supporting information may be found online via the journal website.

Appendix S1. Reflexivity statement.

Table S1. Topic guide for exploratory focus groups.

Table S2. African Region Round 3 questionnaire with and without protocol deviation.

Table S3. Findings from all three Delphi process rounds.

Table S4. Characteristics of experts.