

Title:**Consensus on training and implementation of Enhanced Recovery After Surgery: A Delphi study****Authors**

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Disclaimer: There are no financial declarations for this paper.

Funding: None.

Previous presentations:

The data in this paper has, in part, been presented at the following meeting:

The international ERAS Conference: Lyon May 2017.

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Word Count: 2639

Acknowledgements:

The authors are grateful to the experts who contributed to this project.

Abstract (2)

Background

Enhanced Recovery After Surgery (ERAS) is widely accepted in current surgical practice due to its positive impact on patient outcomes. The successful implementation of ERAS is challenging and compliance with protocols varies widely. Continual staff education is essential for successful ERAS programmes. Teaching modalities exist but there remains no agreement regarding the optimal training curriculum or how its effectiveness is assessed. We aimed to draw consensus from an expert panel regarding the successful training and implementation of ERAS.

Methods

A modified Delphi technique was used; three rounds of questionnaires were sent to 58 selected international experts from 11 countries across multiple ERAS specialities and multidisciplinary teams (MDT) between January 2016 and February 2017.

We interrogated opinion regarding 4 topics: (i) the components of a training curriculum and the structure of training courses; (ii) the optimal framework for successful implementation and audit of ERAS including a guide for data collection; (iii) a framework to assess the effectiveness of training; (iv) criteria to define ERAS training centres of excellence.

Results

An ERAS training course must cover the evidence-based principles of ERAS with team orientated training. Successful implementation requires strong leadership, an ERAS facilitator as well as an effective MDT. Effectiveness of training can be measured by improved compliance. A training centre of excellence should show a willingness to teach and demonstrable team working.

Conclusions

We propose an international expert consensus providing an ERAS training curriculum, a framework for successful implementation, methods for assessing effectiveness of training, and a definition of ERAS training centres of excellence.

Introduction

Enhanced Recovery After Surgery (ERAS) protocols aim to reduce the stress response to surgery and optimise postoperative recovery by employing a multimodal approach to perioperative management. The safety of ERAS protocols have been demonstrated in several randomised trials^{1,2} and numerous studies and meta-analyses have shown the efficacy of ERAS in colorectal surgery³⁻⁵. Improved outcomes have now been demonstrated across multiple surgical specialities including benign and malignant Upper Gastro-Intestinal surgery, Hepato-Pancreato-Biliary surgery, Thoracic surgery, Urology, Gynaecology and Orthopaedic surgery⁶.

It has been shown that improved compliance with ERAS protocols results in better short-term outcomes in terms of length of stay, re-admission and complications³. Difficulties in protocol implementation and compliance, maintenance of protocols as well as patient, staff, practice and/or resource factors have all been implicated as reasons why the success by the pioneering groups has been hard to replicate^{7,8}. The postoperative elements of ERAS protocols are especially difficult to achieve high levels of compliance^{7,9}.

Maintaining a successful ERAS programme requires continual staff education across the whole multi-disciplinary team MDT¹⁰. There are a multitude of training resources currently available with the aim of promoting good practice in ERAS. However, despite these resources, there is no current consensus on the optimum content (curriculum) for ERAS training or the best method to deliver this training. There is also a need for a framework to assess effectiveness of training and education in ERAS, and criteria to define expert sites in ERAS training - centres of excellence.

The aim of this study was to draw consensus from an expert panel on the key elements of an ERAS training curriculum and how such a curriculum should be delivered, key factors for

successful implementation of ERAS, the optimal method of assessment of ERAS training and the criteria to identify centres of excellence in ERAS training.

Materials and Methods

An initial focus group was formed amongst the authorship and other senior members of the international ERAS society and four main topics within the theme of training and implementation of ERAS were proposed as areas in need of further interrogation:

1. The components of a training curriculum and the structure of training courses
2. The optimal framework for successful implementation and audit of ERAS including a guide for data collection
3. A framework to assess the effectiveness of ERAS training
4. criteria to define ERAS training centres of excellence.

Delphi process

A modified Delphi technique was used to gain consensus on these four topics. This involves a reiterative process of interrogation of a group of experts. Expert opinion from various sources is combined using qualitative then quantitative methods with the aim of converging on a shared consensus result^{11,12}. Notable characteristics of the Delphi technique include: anonymity, controlled feedback of opinion, reiteration of concept and potential for application of statistical analysis techniques. It has been widely used in healthcare in areas such as epidemiology, education and improving clinical practice¹³⁻¹⁵.

This modified Delphi study involved three rounds of questioning to an expert group between January 2016 and February 2017 and an interactive focus group of ERAS novices at the international ERAS conference in Lisbon on 27th-30th April 2016.

Fifty-eight experts were chosen to complete the first round questionnaire. Experts were selected based on their peer standing as pioneers or early adopters of ERAS and from multiple specialties including colorectal surgery, urology, gynaecology, upper gastrointestinal surgery, hepatobiliary surgery, orthopaedic surgery and elderly care (Figure 1). The experts included

representation from a wide range of healthcare professionals including surgeons, anaesthetists, nurses, educationalists, healthcare management and patient public representatives (Figure 2) and came from a number of countries including the United Kingdom, Denmark, Sweden, Switzerland, France, Germany, Netherlands, Spain, Canada, USA and New Zealand.

Open questions were formulated and experts were invited by e-mail to complete an online questionnaire (online appendix 1) using Survey Monkey or to complete a paper version and return by post. Non-responders received 2 reminders by e-mail. The responses to this first round were then collated to generate a limited number of statements or choices to form the second-round questionnaire. In the second round, experts were then asked if they agreed or disagreed with each statement presented in the questionnaire.

Focus group

The outcome of the second round was presented to a focus group (12 people) at the international ERAS conference in Lisbon on 27th-30th April 2016. The focus group was facilitated by three expert authors (NKF, MH and DL) and all delegates at the conference were invited to attend regardless of level of experience with training or implementation of ERAS. The focus group aimed to contextualize the experts' opinions within the reality of different health care systems in order to improve the generalizability of the consensus statements. The opinions expressed by those in the group were considered in the formulation and modification of the questions for round three of interrogation. The qualitative phase data following the focus group was transcribed and analysed by FC and added to the structure and format of the final rounds questionnaire. This included editing or adding new questions prior to final vote.

The final round aimed to obtain a final consensus. An online survey was designed and was sent out to the experts in January 2017 and the experts were asked to indicate their level of agreement to a set of statements or questions based on a Likert scale from 1-5 (1= strongly

disagree, 5=strongly agree) or select applicable answers (from suggestions based on the workshop and first 2 rounds of voting). Participants were also invited to make any additional suggestions or comments.

Data Analysis

This was based on percentage response rates and the consensus data was reported as the weighted average score for each question. Any additional questions in the final round were presented as percentages. A pragmatic approach was applied by the study review panel, whereby top ranked responses to each question over the 70th percentile were deemed to have met consensus.

Results

Thirty five experts responded to the first round questionnaire (60.34%). Thirty three (56.9%) experts responded to the second round and 31 (53.4%) to the final round.

Of the experts completing the first round questionnaire, twenty-five (71%) had over 5 years of experience utilising ERAS protocols or principles (figure 3) and twenty one (60%) had over 5 years of ERAS teaching experience (figure 4). Fifteen experts included in this consensus (26%) have been influential in implementing ERAS programmes in over 150 sites (figure 5).

Following presentation of the second round at the workshop in Lisbon, seven further questions were added to the final round questionnaire that were felt to be of additional value (figure 6).

Several elements were also added to existing elements of the questionnaire: regarding MDT implementation, “Awareness of ERAS among the team” was added to questioning; regarding Data collection questioning, “Patient reported outcome measures”, “readiness of discharge”, and “complications” was added; regarding defining ERAS expert sites, “ability to adapt to local challenges” was added to questioning.

Following the final round, expert panel consensus statements were made in all four domains of ERAS training and implementation interrogation: (i) the components of a training curriculum and the structure of training courses; (ii) the optimal framework for successful implementation and audit of ERAS including a guide for data collection; (iii) a framework to assess the effectiveness of ERAS training; (iv) criteria to define ERAS training centres of excellence.

(i) The components of a training curriculum and the structure of training courses

Expert consensus was achieved regarding the elements that should be included within an ERAS training curriculum (figure 7). The most important components included teaching up to date evidence based principles of ERAS, audit and feedback processes, and integrating the whole patient journey into training. A didactic teaching course with clinical components was the least desirable part of the curriculum.

It was agreed that teaching methods to deliver an ERAS curriculum should incorporate both individual and MDT based learning methods. The expert panel suggested that the ERAS curriculum should be taught via team based training with a multidisciplinary faculty (96.67%), face to face training (93.33%), online modules/e-learning with integrated assessment (76.67%) and as part of the undergraduate nursing and medical curricula (76.67%). Continual audit and feedback should be performed to demonstrate the benefits of teaching methods (73.33%). As well as educating healthcare professionals, patients should be informed about ERAS with pathway “walkthrough” methods (70%).

(ii) The optimal framework for successful implementation and audit of ERAS including a guide for data collection

Consensus was reached regarding the essential elements for optimum ERAS implementation (Figure 8). Highlighting the importance of MDT working, effective leadership and continual audit and data collection. Essential elements also included management support, a dedicated ERAS nurse or facilitator and promoting awareness of ERAS amongst the whole surgical team.

The experts suggested that MDT team working and learning together can be best achieved by development of an effective system of feedback (97%), strong leadership and vision (90%),

regular scheduled meetings (80%), clearly aligned goals for patient care (80%) and collaborative development of ERAS pathways (77%).

An agreement was also reached on the key characteristics of successful ERAS leaders. They must be passionate and positive about ERAS (97%), locally respected and able to influence clinical and management colleagues (97%).

Senior management engagement was deemed by the experts to be essential for ERAS success (87%), as well as linking clinical outcomes of ERAS to organisational objectives (87%), including a senior manager within the ERAS team (80%) and sharing the positive outcomes of ERAS with senior management (77%).

A dedicated ERAS nurse or facilitator was proposed by the experts to ensure optimum ERAS implementation. The ERAS facilitator, a role in the UK performed by non clinical, managerial or administrative staff should be enthusiastic team members and have the correct skills and abilities as well as funded time available to develop the role (86.67%). They must also have clear roles and responsibilities (83.33%).

The experts voted for what should constitute the minimum amount of ERAS data collected during an audit process (figure 9). They also agreed that the challenges of ERAS data collection include a lack of human resources (4.13), a lack of time (4.10) and non-automated or inefficient processes (4.00). Figure 10 outlines the methods the experts suggested to support collection of data relevant to the audit process.

(iii) A framework to assess the effectiveness of ERAS training

The experts have proposed a framework by which the effectiveness of ERAS training can be assessed. This includes registering prompt feedback from course delegates and monitoring post-training compliance with ERAS components (Figure 11).

Practically, assessment methods for ERAS teaching courses should include prompt feedback from participants after each course (96.67%) and the follow up of “trained” centres using faculty feedback (76.67%). The feedback provided by faculty should be performed using standardised online feedback forms (70.00%).

(iv) Criteria to define ERAS training centres of excellence.

The expert panel agreed that a successful ERAS training centre should demonstrate: regular audit and data collection, a willingness to teach, effective teamwork, high compliance with ERAS elements and be adaptable to local implementation challenges (figure 12).

The success of an expert centre’s own ERAS programme should be demonstrated by publication of data (87.10%) together with scheduled observation visits (77.42%) and both attendance and presentation at national or international meetings (74.19%).

Discussion

Successful implementation of ERAS programmes requires continual staff education. Despite there being a large number of courses and implementation programmes available, there is no consensus on the essential elements required for successful training and implementation of ERAS.

To our knowledge, this is the first study to provide an agreed consensus on the content of a training curriculum, and a guide for implementation, training and audit of all aspects of ERAS. The proposed curriculum encompasses clear guidance on the optimal implementation and audit of ERAS including optimal training methods, methods of assessment and quality assurance of ERAS training, data collection, and criteria for defining expert training centres.

A modified Delphi method was applied to identify and rank the most important elements of the training curriculum of ERAS and its implementation from an expert panel. It was also important to obtain novices' views on the issue of implementation, hence we include a focus group into the design of this study. This final consensus document has summarised the essential components of ERAS training. Team based training with a multi-disciplinary team (MDT) approach has been recommended as the optimal method to deliver an evidence based training curriculum.

Successful implementation requires strong leadership, a dedicated ERAS facilitator as well as an effective ERAS MDT. Having dedicated ERAS personnel with clearly defined roles was deemed to be essential for both data collection and feeding back the outcomes of ERAS to the MDT. The experts agreed on a minimum dataset for ERAS audit including clinical and functional outcomes in addition to protocol compliance.

Assessment of ERAS training has never been explored prior to this study. Collecting standardised feedback from both delegates and faculty, inter-disciplinary teaching and learning and monitoring ERAS compliance following training have been proposed by the expert panel as the best method to assess the real impact of ERAS training.

Willingness of a unit to teach and demonstrate effective team working are considered by our panel to be the top requirements to define ERAS expert centres. These centres should also show regular data collection and audit processes and sustain high compliance with ERAS elements. There is no doubt that the success of an ERAS centre relies on effective leadership. This Delphi process has now defined the criteria for identification of such a leader: they must be passionate and positive about ERAS and engage and include senior management in order to impact and sustain change.

Prior research on ERAS has focused mainly on the evidence supporting each element across different surgical specialities and recommended the role of clinical champions and the presence of a dedicated ERAS facilitator^{16-18,19}. However these guidelines did not address the practicalities of training or how to tackle difficulties with implementation. Through this study we have been able to draw consensus regarding the essential components of a training curriculum, how that training is best delivered, how training quality should be assessed and how to identify those centres that are excelling in ERAS training delivery. We have also suggested practical methods for assessing how successful ERAS programmes could be demonstrated including publication of data on specific criteria, observation of successful centres and representation of success at national and international meetings.

There are a number of limitations to this study. Consensus statements in general are considered weak evidence. However, they are still the optimal method in identifying areas to channel further research and future practice, particularly when there are implementation challeng-

es reflected by a wide variation in implementation and outcome as in ERAS⁸. The initial rounds of this study identified many local barriers and challenges to adopting and sustaining ERAS, and practical solutions were proposed in the final consensus statements. The selection of experts is another critical issue with consensus statements. The group of experts involved in this research were all recommended by their peers as experts in the field and they are generally distributed across Europe and beyond. The experts represented a broad range of different specialities and disciplines to ensure generalisability of the results. The experts have significant experience in developing and utilizing ERAS protocols, extensive teaching experience and proven records in implementation of ERAS protocols following the delivery of training. In this study, the response rate was relatively high (over 60%) compared to other similar studies, indicating the commitments of the experts to draw consensus on the given issues. Additionally, the contribution of the review panel of data collection could arguably dilute or alter the original intent. Although the review panel contributed to reducing redundancy, combining and clarifying the questions which are requirements of the Delphi process, the review panel made every effort in preserving the initial questions' intent.

In conclusion, a detailed framework for a structured ERAS training curriculum and implementation strategy has been proposed to ensure successful and sustained application of ERAS. The framework encompasses various training modalities and assessment and has the potential to provide quality control and potentiates future ERAS research to improve implementation and patient outcomes.

Figures

Figure 1. Speciality of selected expert panel

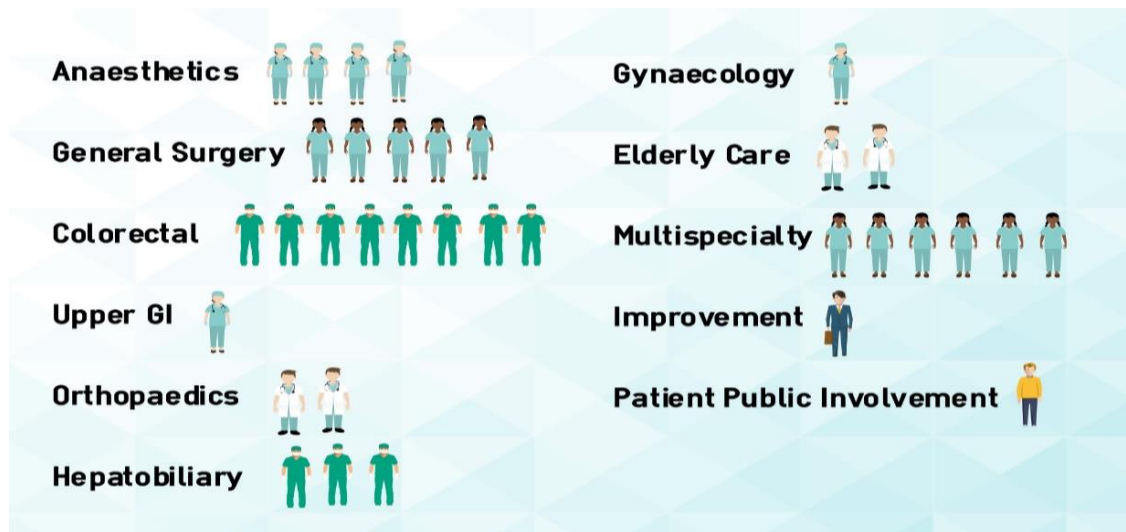


Figure 2. Positions held by members of selected expert panel

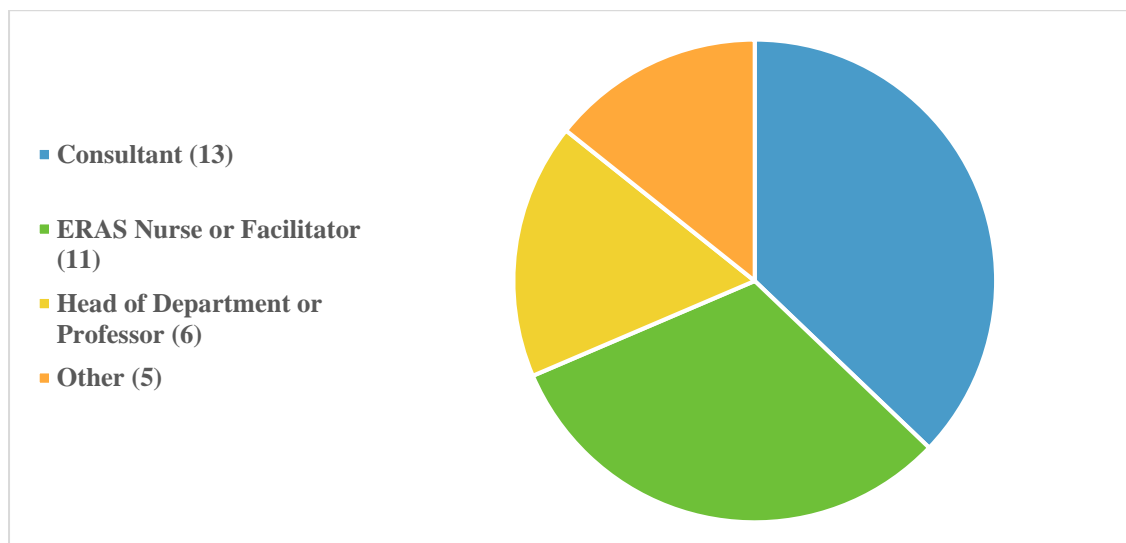


Figure 3. Length of time utilizing ERAS protocols by selected expert panel

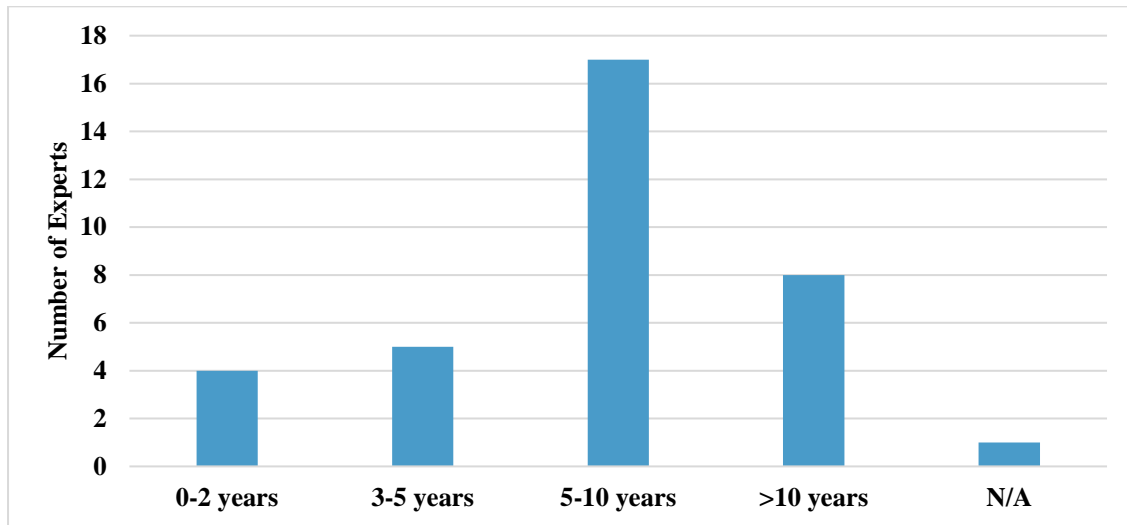


Figure 4. Length of time teaching ERAS by selected expert panel

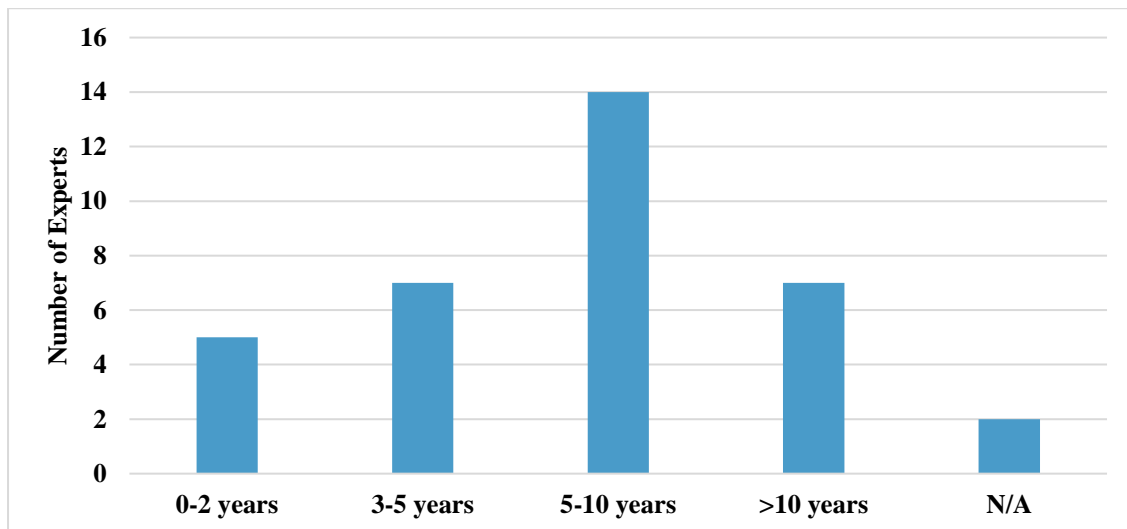


Figure 5. Number of centres implementing ERAS following training delivered by selected experts

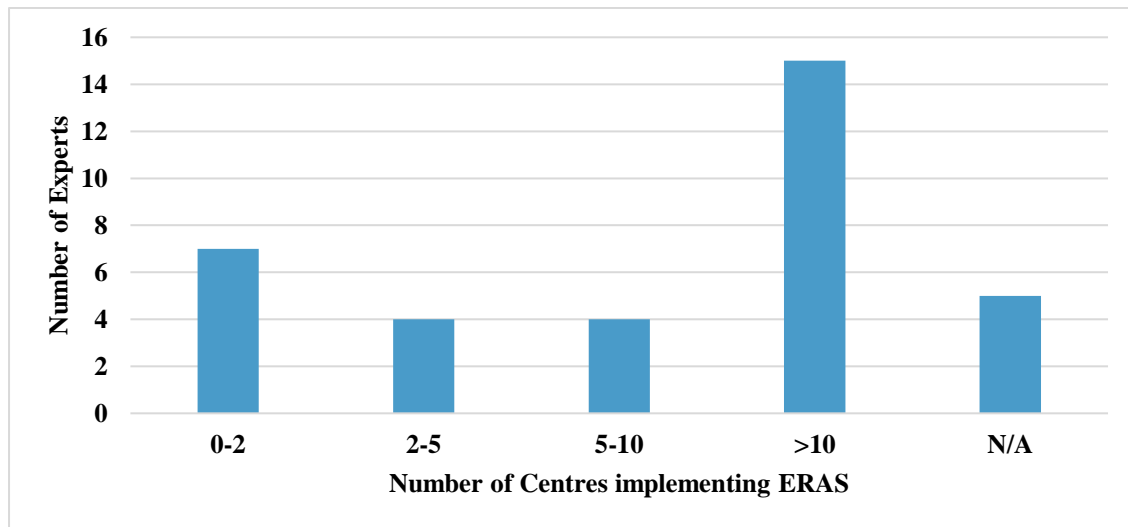


Figure 6. Questions added to round three of interrogation following workshop

Multidisciplinary team working and learning together can be best achieved by...choose all that apply

- Regular scheduled meetings
- Clearly aligned goals for patient care
- Collaborative learning sessions
- Feedback of results to whole team
- Strong leadership and vision
- Collaborative development of pathways

Which of the following attributes are important for "leadership by a senior clinician"?...choose all that apply

- Leader must be positive and passionate about ERAS
- ERAS lead must be locally respected and able to influence clinical and management colleagues
- Identify an early adopter of ERAS locally
- Create a small stipend or funded sessions to lead ERAS
- Provide project management support
- ERAS lead should be a surgeon or anaesthetist
- ERAS lead could be from any relevant role in the team

How can "management support" be achieved?...choose all that apply

- Engagement with senior management
- Incentives through commissioning or funding
- Include senior manager in ERAS team
- Share positive outcomes with senior management
- Link clinical outcomes to organisational objectives

Which of the following are useful to secure the "involvement of an ERAS nurse or facilitator"?...choose all that apply

- Demonstrate a clear financial incentive to create and fund the role
- Current staff member may "self select" and adapt their job description
- Clarify the role and responsibilities
- More than one facilitator is required to ensure continuity
- Enthusiastic team member, with the correct skills and abilities, should have funded time available to develop the role

How can the success of an expert centre's own ERAS programme be practically demonstrated?...choose all that apply

- Publication of data on specific criteria
- Using Encare database/reporting tool
- Presence of an ERAS nurse or facilitator
- Peer review
- Centre visit and observation
- Team scorecard or survey
- Summary reports of training sessions, including feedback
- Attending and presenting at regional, national or international meetings

The ERAS curriculum should be taught using the following methods...choose all that apply

- Online modules/e-learning with assessment
- Face to face training
- Modular, self directed learning
- Expert email follow up for ongoing queries
- Team based training with a multidisciplinary faculty
- Cased based discussion
- Patient experiences and pathway "walkthrough", involving patients in the course
- ERAS audit system
- Didactic teaching to cover the fundamental and evidence of ERAS
- Include more than one set of learners in the course
- Training should be bespoke for each institution
- During staff induction
- As part of the undergraduate nursing and medical curricula
- Ward based learning, led by an ERAS nurse
- Ongoing audit and feedback to demonstrate the benefits
- Courses for different specialties should have a faculty lead from the same specialty
- Review the guidelines

The ERAS training course should be practically assessed using the following methods...choose all that apply

- Prompt feedback from participants after each course
- Online feedback forms
- Compulsary submission of data (from learners)
- Regular reporting to expert site
- Follow-up by faculty

Figure 7. ERAS training curriculum and course content

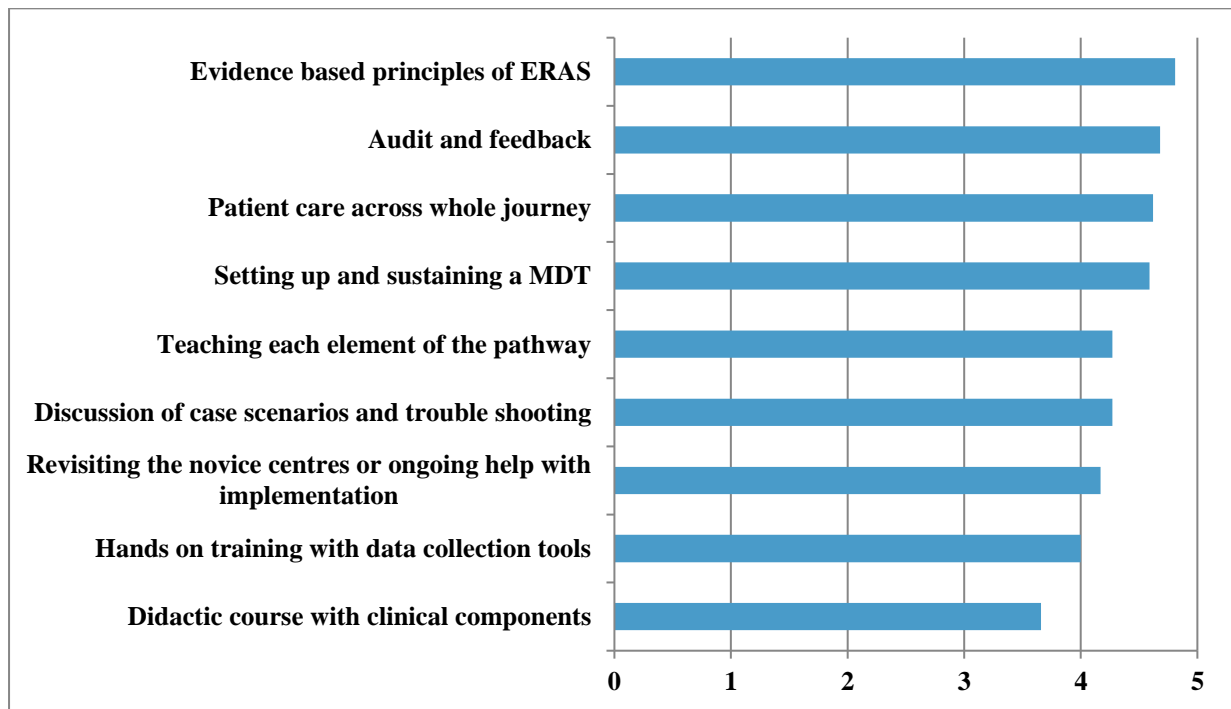


Figure 8. Essential elements for optimum ERAS implementation

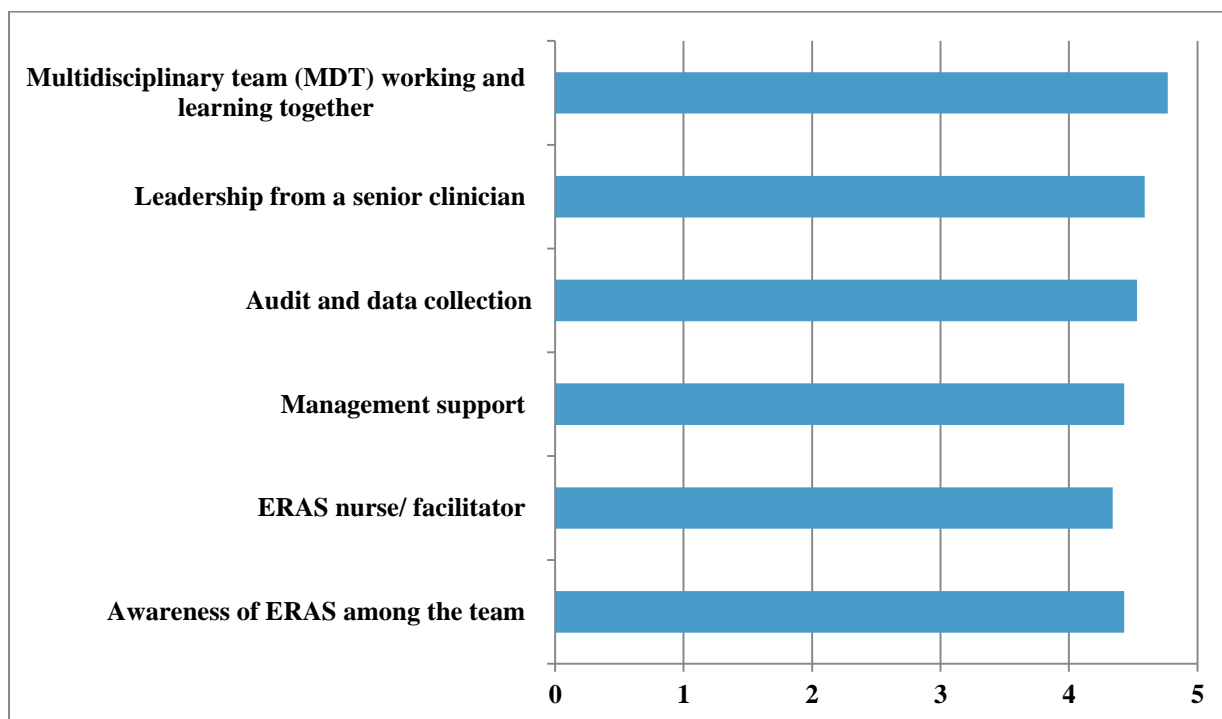


Figure 9. ERAS data collection elements

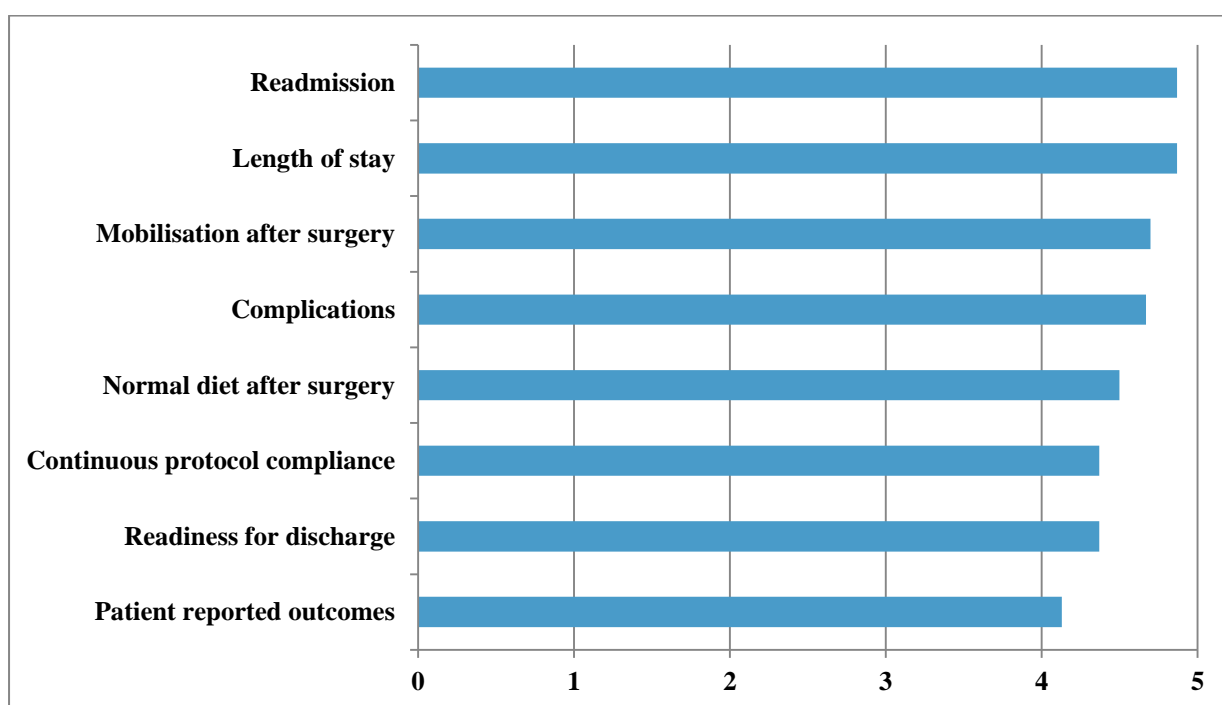


Figure 10. Methods to support ERAS Data Collection

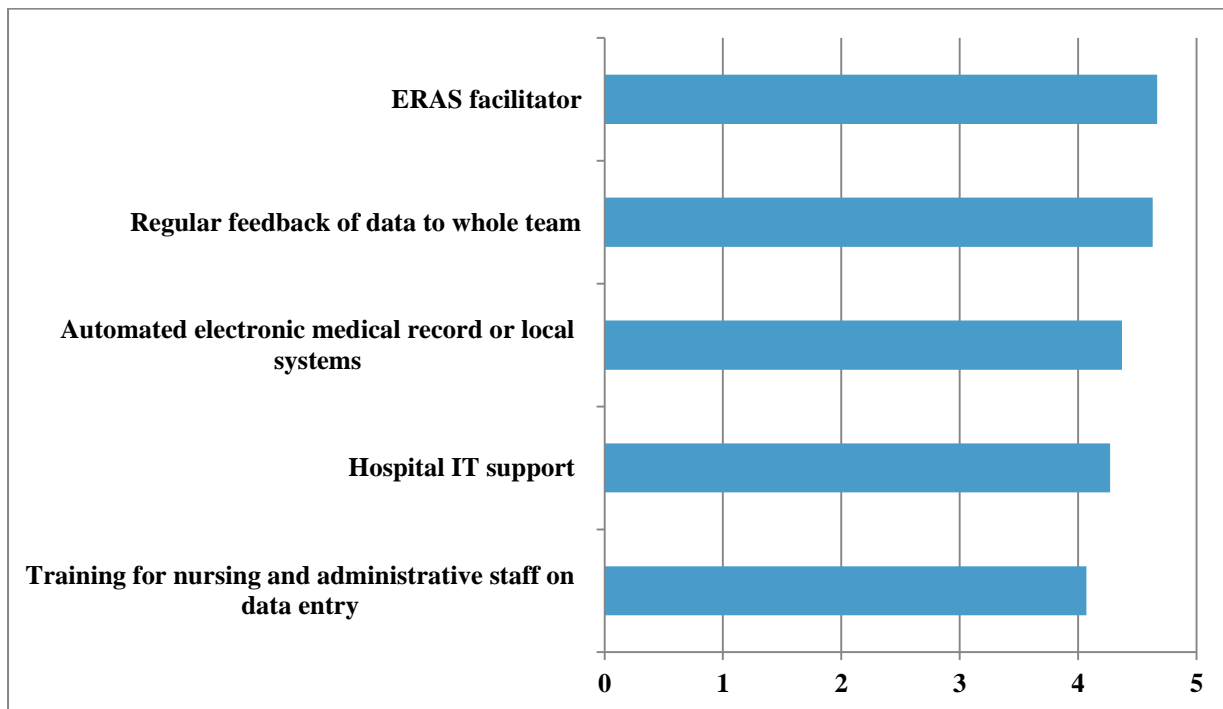


Figure 11. Framework of assessment of training and education

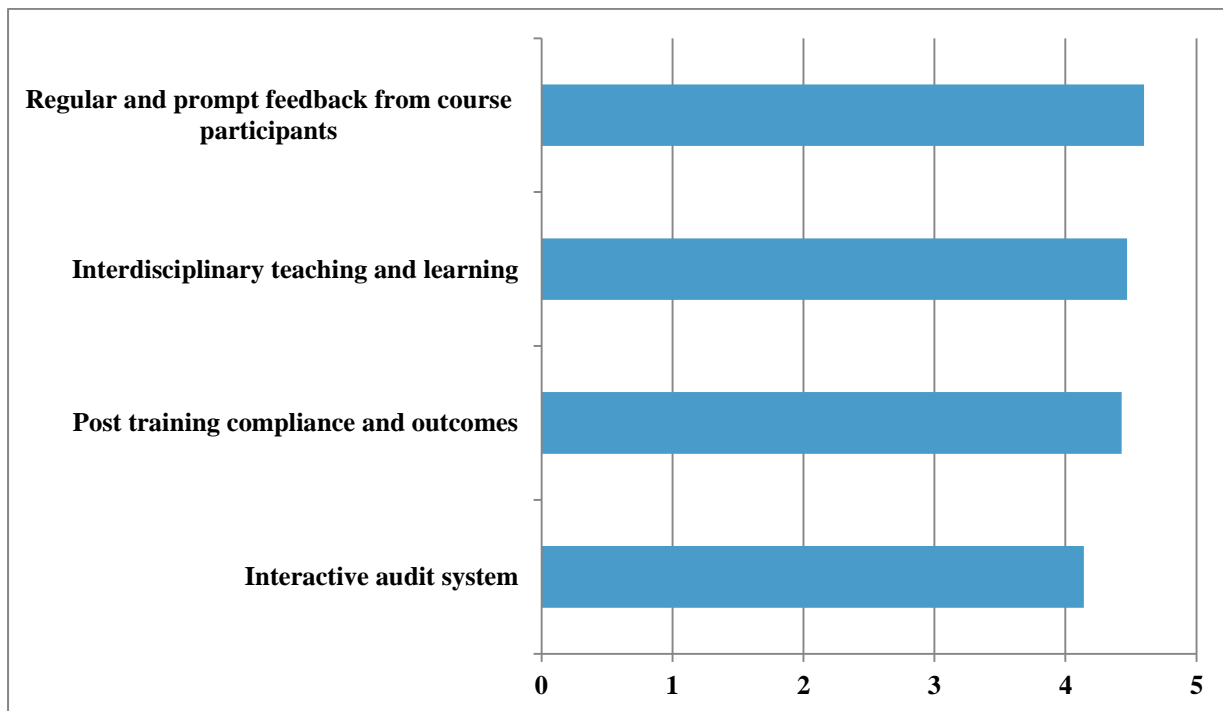
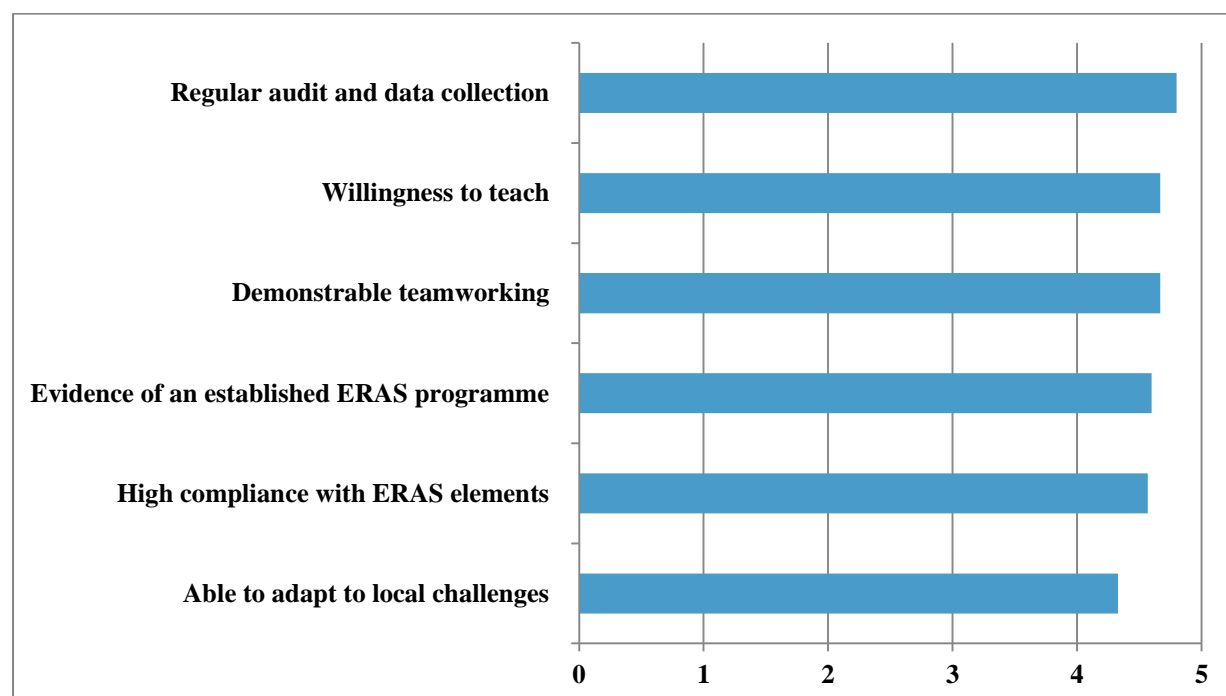


Figure 12. Criteria to define expert ERAS training Centre



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