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Survey of provider perceptions of enhanced recovery after surgery and perioperative surgical home protocols at a tertiary care hospital

Eliza W. Beal, MD, MS[a], Joshua-Paolo C. Reyes, BS[b], Zachary Denham, MD[c], Mahmoud Abdel-Rasoul, MS, MPH[d], Eyad Rasoul, BA[b], Michelle L. Humeidan, MD, PhD[b,*]

Abstract

Enhanced recovery after surgery (ERAS) and perioperative surgical home (PSH) initiatives are widely utilized to improve quality of patient care. Despite their established benefits, implementation still has significant barriers. We developed a survey for perioperative clinicians to gather information on perception and knowledge of ERAS/PSH programs to guide future expansion of these programs at our institution. The survey included questions about familiarity with ERAS/PSH and perceived value, perceived barriers to protocol implementation, preferred learning methods and prioritization of various ERAS/PSH protocol elements into care delivery and provider education. Faculty surgeons and anesthesiologists, in addition to advanced practice nurses and postgraduate physician trainees in the Departments of Surgery and Anesthesiology were asked to complete the survey. Overall survey participation was 25% (223/888). About half of survey respondents had provided care to a patient on an ERAS/PSH protocol, and a majority felt at least somewhat knowledgeable about ERAS/PSH protocols. Perception of the value of ERAS/PSH was positive. Participants were enthusiastic about on-going learning, with multimodal pain management being the topic of most interest and learning by direct participation in care of protocol patients being the favored educational approach. A significant majority of participants felt that upcoming health providers should receive formal ERAS/PSH education as part of their training. Based on our survey results, we plan to explore teaching methods that successfully engage learners of all levels of clinical expertise and also overcome the major barriers to gaining knowledge about ERAS/PSH identified by study participants, most notably lack of time for busy clinicians.

Abbreviations: ASA = American Society of Anesthesiologists, ASER = American Society for Enhanced Recovery, ERAS = enhanced recovery after surgery, IQR = interquartile range, IRB = Institutional Review Board, PSH = perioperative surgical home, REDCap = research electronic data capture.

Keywords: enhanced recovery after surgery (ERAS), ERAS education, ERAS survey, perioperative surgical home (PSH), PSH education

1. Introduction

A primary focus of national and international medical professional organizations like the Enhanced Recovery After Surgery (ERAS) Society, American Society for Enhanced Recovery (ASER) and the American Society of Anesthesiologists (ASA) is to improve consistent use of evidence-based perioperative care for surgical patients by instituting standardized care protocols.[1,2] ERAS initiatives are multidisciplinary perioperative programs that aim to accelerate recovery, shorten hospital stays, and reduce complication rates following surgery.[3] The ASA has initiated a complementary care pathway called perioperative surgical home (PSH) aimed at transitioning surgical care from a fragmented, expensive, and reimbursement-driven culture to a quality and service-driven culture.[4,5] Core components of ERAS and PSH clinical pathways include: strong continuity and coordination of surgical care, patient-focused and shared decision-making, standardized protocols for pain management, physical activity promotion, patient hydration, and minimization of drains/lines.[4–8] These types of quality improvement initiatives have shown consistent decreases in postoperative complications, improved patient outcomes, shortened length of stay, better operational efficiency and cost savings.[3,6,7,9–13]

Despite established benefits of ERAS/PSH protocols, implementation still has significant barriers, and a number of studies have been published about provider awareness and opinions of

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[a] Department of Surgery, [b] Department of Anesthesiology, The Ohio State University Wexner Medical Center, Columbus, Ohio, [c] Department of Anesthesiology and Perioperative Medicine, University of Pittsburgh, Pittsburgh, Pennsylvania, [d] Department of Biomedical Informatics, The Ohio State University College of Medicine, Columbus, Ohio, USA.

[*] Correspondence: Michelle L. Humeidan, Department of Anesthesiology, The Ohio State University Wexner Medical Center, 410W. 10th Ave., N411 Doan Hall, Columbus, OH 43210-1267, USA (e-mail: Michelle.Humeidan@osumc.edu).

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clinical pathways to investigate challenges. Factors such as poor perception of real-world practicality and low expectations for impact on outcomes are among specific barriers preventing unanimous adoption of clinical practice guidelines, practice parameters, policies and consensus statements among health care providers.[14] Page et al found that the overwhelming majority of providers performing open liver resection endorsed the ERAS pathway, but the greatest hurdle to implementation was general provider aversion to a standardized protocol.[15] A survey out of Australia and New Zealand noted that only 37% of specialist colorectal surgeons routinely cared for patients in an established ERAS pathway, and lack of institutional support was noted as the most significant barrier (39%), along with lack of interest from co-specialty personnel (33%).[16] Short et al surveyed pediatric surgeons on their willingness to adopt ERAS elements for adolescents undergoing colorectal surgery.[17] A majority of their respondents (68.4%) were at least "moderately" familiar with ERAS and cited lack of administrative support and educational materials as major barriers to successful ERAS implementation. A multicenter survey at institutions with ERAS programs in Switzerland and Sweden revealed that although medical team members expected ERAS to reduce complications, shorten hospital stay and improve patient satisfaction, factors such as time restraints, reluctance to change and logistics were still obstacles to implementation.[18] Much less information is available about provider perceptions in the newer PSH practice models, but barriers like defining roles and achieving practice consensus among anesthesiologists, surgeons, and hospital administrators have been reported.[19] Although the value of the PSH to patient care was recently voiced by the surveyed program directors of anesthesiology residency programs, training specific to PSH is not consistently being incorporated into training curricula.[20] Likewise, lack of understanding on how to best educate and engage resident physicians caring for ERAS patients has been reported.[21]

We surveyed perioperative clinicians from surgery and anesthesiology across a large academic medical center to gather baseline information on perception and knowledge of our current enhanced recovery and surgical home programs, and to seek guidance for future educational strategies as we work toward the goal of expansion of these programs into a wide variety of procedures. Included in the survey were questions about familiarity with ERAS/PSH and perceived value, perceived barriers to protocol implementation, preferred learning methods and prioritization of various ERAS/PSH protocol elements into care delivery and provider education. The survey data presented here provide useful insight into opportunities for improved engagement and specific preferences of practicing clinicians and trainees regarding ERAS/PSH education.

2. Methods

We designed a survey to evaluate the perception, knowledge and preferences for learning about ERAS and PSH protocols among surgery and anesthesia providers at our institution. There were no validated tools available, thus we designed a new survey instrument (see Supplemental Materials Figure 1, http://links.lww.com/MD/G201). We strived for a diverse population of individual responders, including faculty surgeons and anesthesiologists, postgraduate trainees in surgery and anesthesiology, and advanced practice nurses. The survey was administered via the internet-based research electronic data capture (REDCap) system and providers received a link to the survey via institutional email. This study was approved by the Institutional Review Board (IRB) of the Ohio State University. Informed consent was obtained from each participant. All responses were anonymous. We collected demographic data including age, role, years in practice, clinical specialty, gender, location of practice, and whether the respondent had taken care of a patient on an ERAS/PSH protocol. The survey questionnaire was designed with the goals of procuring important insight into barriers to implementation and preferred educational strategies going forward.

The Ohio State University Wexner Medical Center is a tertiary care and academic medical center that encompasses 100 buildings and over 1,300 inpatient beds. The Wexner Medical Center is comprised of University Hospital, The James Cancer Hospital, The Ross Heart Hospital, and several ambulatory surgery sites. University Hospital services the most diverse surgical population. In addition, we surveyed providers from a partnered hospital, Nationwide Children's Hospital. In total, 888 perioperative clinicians were contacted for study participation including faculty surgeons and anesthesiologists, and postgraduate trainees and advanced practice nurses in surgery and anesthesiology. Department of Surgery affiliates made up the majority of possible participants (620 (70%)), and 268 (30%) were affiliated with the Department of Anesthesiology.

At our institution, the first ERAS protocol was introduced for microvascular breast reconstruction in June of 2016 and the second for colorectal surgery in March of 2017. While patient inclusion in the ERAS protocol for microvascular breast reconstruction is mandated, patient inclusion for colon and rectal surgery is voluntary on the part of the attending surgeon, and participation at the time of the survey was approximately 70%. These clinical protocols were designed by multi-disciplinary teams including attending physicians, fellows, residents, and nurse practitioners from surgery and anesthesiology, as well as bedside, clinic and perioperative nurses, pharmacists, dieticians, clinical care coordinators, and process improvement experts. The protocols were introduced at the Departments of Surgery and Anesthesiology Grand Rounds and informational meetings with clinic and perioperative staff, fellows and residents. Surveys were completed over between May and June 2017. The survey was sent via email to each potential participant 3 times, spaced at 1-week intervals.

Summary statistics are reported as median (interquartile range, IQR) for continuous variables and frequency (percentage) for categorical variables. Comparative analyses were performed using Pearson Chi-square, Fisher's exact and Kruskal-Wallis tests, where appropriate. Survey dropout data was considered to be missing at random. All statistical analyses were performed using SAS version 9.4 (SAS Institute, Cary, NC).

3. Results

Overall survey participation was 25% (223/888), with 24% (151/620) of possible Department of Surgery respondents and 27% (72/268) of possible Department of Anesthesia respondents taking part. Twenty-one percent (188/888) of survey participants completed every question.

3.1. Demographics

Comprehensive summaries of survey participant demographics are provided in Table 1, along with subclassification by clinical

Table 1

Respondent demographics overall and by department.

Variable	Overall (N = 223)	Surgery (N = 151)	Anesthesia (N = 72)	*P* value
Age, median [IQR], yr	36.0 [31.0, 44.0]	36.0 [31.0, 44.0]	36.5 [32.0, 43.5]	.522
No.	221	149	72	
Sex, N (%)				
Missing	2 (1)	2 (1)	0 (0)	.381
Male	132 (59)	86 (57)	46 (64)	
Female	89 (40)	63 (42)	26 (36)	
Department, N (%)				
Surgery	151 (68)	N/A	N/A	<.001
Anesthesia	72 (32)	N/A	N/A	
Role, N (%)				
Missing	2 (1)	2 (1)	0 (0)	<.001
Attending	93 (42)	71 (47)	22 (31)	
Non-physician provider	52 (23)	19 (13)	33 (46)	
Fellow/resident	76 (34)	59 (39)	17 (24)	
PGY (if fellow/resident), N (%)				
No.	76	59	17	
1	14 (18)	12 (20)	2 (12)	.287
2	21 (28)	15 (25)	6 (35)	
3	13 (17)	10 (17)	3 (18)	
4	14 (18)	8 (14)	6 (35)	
5	8 (11)	8 (14)	0 (0)	
6	3 (4)	3 (5)	0 (0)	
7	3 (4)	3 (5)	0 (0)	
Years in practice (if attending or non-physician provider) N (%)				
No.	145	90	55	
Missing	1 (1)	1 (1)	0 (0)	.668
<5 yr	41 (28)	27 (30)	14 (26)	
5–10 yr	45 (31)	27 (30)	18 (33)	
11–15 yr	19 (13)	9 (10)	10 (18)	
16–20 yr	13 (9)	9 (10)	4 (7)	
21–25 yr	6 (4)	3 (3)	3 (6)	
>25 yr	20 (14)	14 (16)	6 (11)	
Location, N (%)				
Missing	2 (1)	2 (1)	0 (0)	<.001
Ross Heart Hospital	12 (5)	2 (1)	10 (14)	
James Cancer Hospital	41 (18)	37 (25)	4 (6)	
University Hospital	105 (47)	72 (48)	33 (46)	
Brain and Spine Hospital	4 (2)	4 (3)	0 (0)	
University Hospital East	16 (7)	11 (7)	5 (7)	
Stefanie Spielman Cancer Center	1 (<1)	1 (1)	0 (0)	
Jameson Crane Sports Medicine Institute	5 (2)	4 (3)	1 (1)	
Nationwide Children's Hospital	4 (2)	3 (2)	1 (1)	
All locations	33 (15)	15 (10)	18 (25)	

department (Table 1) and clinical role (Table 2). Males made up the majority of all respondents (male 59% (N = 132); female 40% (N = 89), gender not disclosed 1% (N = 2); $P = .381$). A larger percentage of participants were affiliated with the Department of Surgery (68% (N = 151) compared to the Department of Anesthesiology (32% (N = 72), $P < .001$). Representation of clinical roles by survey participants differed between departments with attending physicians comprising the largest group of respondents (47%, N = 71) and non-physician advanced practice providers the smallest group (13% (N = 19) in the Department of Surgery, while in the Department of Anesthesiology, non-physician providers comprised the largest group ((46%, N = 33), $P < .001$) (Table 1). Furthermore, more than three-fourths of all physician participants (attendings and postgraduate trainees) were in the Department of Surgery, and more than two-thirds of all non-physician survey participants were in the Department of Anesthesiology ($P < .001$) (Table 2). More than 3 times as many surgical trainees participated (N = 57) compared to anesthesiology trainees (N = 17). Attending physician and non-physician provider respondents were approximately 10 years older than resident/fellow respondents (medians: attending physicians 41.0 years [37.0, 52.0]; non-physician providers 40.0 years [33.0, 46.0]; postgraduate trainees 30.0 years [28.0, 52.0], $P < .001$) (Table 2), consistent with reporting of predominantly early career practice durations by respondents (28% (N = 41) in practice for <5 years and 31% (N = 45) in practice between 5 and 10 years, $P = .668$) (Table 1). Regardless of clinical role or department, University Hospital was the dominant work location for respondents (47%, N = 105, $P < .001$) (Table 1).

3.2. Knowledge and perception

Survey data on ERAS/PSH knowledge are summarized in Tables 3 and 4. Though almost half of all respondents reported

Table 2

Respondent demographics by role.

Variable	Attending (N = 93)	Non-physician provider (N = 52)	Fellow/resident (N = 76)	*P* value
Age, median [IQR], yr	41.0 [37.0, 52.0]	40.0 [33.0, 46.0]	30.0 [28.0, 32.0]	<.001
Sex, N (%)				
Male	67 (72)	18 (35)	47 (62)	<.001
Female	26 (28)	34 (66)	29 (38)	
Department, N (%)				
Surgery	71 (77)	19 (37)	59 (78)	<.001
Anesthesia	22 (24)	33 (63)	17 (22)	
PGY (if fellow/resident), N (%)				
1	N/A	N/A	14 (18)	N/A
2	N/A	N/A	21 (28)	
3	N/A	N/A	13 (17)	
4	N/A	N/A	14 (18)	
5	N/A	N/A	8 (11)	
6	N/A	N/A	3 (4)	
7	N/A	N/A	3 (4)	
Years in practice (if attending or non-physician provider), N (%)				
Missing	1 (1)	0 (0)	N/A	.466
<5 yr	27 (29)	14 (27)	N/A	
5–10 yr	25 (27)	20 (39)	N/A	
11–15 yr	12 (13)	7 (13)	N/A	
16–20 yr	7 (8)	6 (12)	N/A	
21–25 yr	5 (5)	1 (2)	N/A	
>25 yr	16 (17)	4 (8)	N/A	
Location, N (%)				
Ross Heart Hospital	8 (9)	4 (8)	0 (0)	<.001
James Cancer Hospital	21 (23)	12 (23)	8 (11)	
University Hospital	43 (46)	18 (35)	44 (58)	
Brain and Spine Hospital	2 (2)	2 (4)	0 (0)	
University Hospital East	10 (11)	5 (10)	1 (1)	
Stefanie Spielman Cancer Center	0 (0)	1 (2)	0 (0)	
Jameson Crane Sports Medicine Institute	2 (2)	3 (6)	0 (0)	
Nationwide Children's Hospital	4 (4)	0 (0)	0 (0)	
All locations	3 (3)	7 (13)	23 (30)	

that they had participated in the care of a patient in an ERAS/PSH protocol (N = 102, 46%), providers from the Anesthesiology Department had significantly more experience than providers in Surgery (71% of Anesthesia respondents compared to only 34% of Surgery respondents reported participating in the care of a protocol patient, $P < .001$). Subsequently, survey participants affiliated with Anesthesiology reported that they knew some (40%, N = 29) or much (35%, N = 25) about ERAS/PSH, with Surgery providers responses reflecting less baseline knowledge about ERAS/PSH ($P = .036$). No departmental differences were noted for the remaining knowledge and perception survey questions. The majority of providers agreed (N = 93, 42%) or strongly agreed (N = 69, 31%) that ERAS/PSH are important for patient care ($P = .254$) and that patients have/will have improved care when they are involved in an ERAS/PSH protocol ($P = .648$). Respondents agreed (N = 100, 45%) or strongly agreed (N = 63, 28%) that ERAS/PSH protocols are a reasonable investment of their time ($P = .416$), and that ERAS/PSH will improve the financial efficiency of our institution (agreed N = 95, 43% or strongly agreed N = 57, 26%, $P = .267$). The majority of respondents (N = 158, 71%) felt that ERAS/PSH protocols have multiple goals including (1) attenuating surgical stress to improve length of stay and reduce postoperative complications; (2) improving hospital efficiency leading to improved financial return in a diagnosis related group payment system; and (3) addressing patient expectations preoperatively to improve patient satisfaction ($P = .418$) (Table 3).

Analysis of knowledge and perception questions by clinical role revealed that postgraduate trainees more commonly reported participating in the care of an ERAS/PSH patient (N = 42, 55%) than non-physician providers (N = 22, 42%) or attendings (N = 38, 41%; $P = .050$), though this did not significantly change perception of baseline knowledge in residents and fellows compared to attendings and non-physician providers ($P = .352$). Answers to the remaining knowledge and perception questions were not different when compared between the attending, non-physician providers and postgraduate trainee groups (Table 4).

3.3. Learning

Survey data for ERAS/PSH education preferences are summarized in Tables 5 and 6. Replies were similar for respondents in both the Departments of Surgery and Anesthesiology, and similar for attendings, non-physician providers and postgraduate trainees; therefore overall survey response data was representative of the clinical department and clinical role subgroups.

Fluid management was the topic of least interest reported by 42% of survey participants (N = 93), followed by improving perioperative efficiency (27%, N = 61). Multimodal pain management was the topic of most interest to 30% of respondents

Table 3

Knowledge and perception overall and by department.

Variable, N (%)	Overall (N = 223)	Surgery (N = 151)	Anesthesia (N = 72)	*P* value
I have participated in the care of a patient in an ERAS/PSH protocol				
Missing	22 (10)	18 (12)	4 (6)	<.001
Yes	102 (46)	51 (34)	51 (71)	
No	99 (44)	82 (54)	17 (24)	
I know _____ about ERAS/PSH				
Missing	22 (10)	18 (12)	4 (6)	.036
Nothing	29 (13)	24 (16)	5 (7)	
Very little	36 (16)	29 (19)	7 (10)	
Some	68 (30)	39 (26)	29 (40)	
Much	63 (28)	38 (25)	25 (35)	
Everything	5 (2)	3 (2)	2 (3)	
I believe ERAS/PSH are important for patient care				
Missing	23 (10)	19 (13)	4 (6)	.254
Strongly disagree	0 (0)	0 (0)	0 (0)	
Disagree	0 (0)	0 (0)	0 (0)	
Neutral	31 (14)	22 (15)	9 (13)	
Agree	102 (46)	71 (47)	31 (43)	
Strongly agree	67 (30)	39 (26)	28 (39)	
I believe that the hospital administration thinks ERAS/PSH are important for patient care				
Missing	23 (10)	19 (13)	4 (6)	.134
Strongly disagree	2 (1)	0 (0)	2 (3)	
Disagree	7 (3)	6 (4)	1 (1)	
Neutral	67 (30)	40 (26)	27 (38)	
Agree	94 (42)	66 (44)	28 (39)	
Strongly agree	30 (13)	20 (13)	10 (14)	
I believe my colleagues think ERAS/PSH are important for patient care				
Missing	23 (10)	19 (13)	4 (6)	.291
Strongly disagree	1 (<1)	0 (0)	1 (1)	
Disagree	9 (4)	6 (4)	3 (4)	
Neutral	56 (25)	32 (21)	24 (33)	
Agree	102 (46)	72 (48)	30 (42)	
Strongly agree	32 (14)	22 (15)	10 (14)	
I believe that my patients have/will have improved care when they are involved in an ERAS/PSH				
Missing	23 (10)	19 (13)	4 (6)	.648
Strongly disagree	0 (0)	0 (0)	0 (0)	
Disagree	0 (0)	0 (0)	0 (0)	
Neutral	38 (17)	27 (18)	11 (15)	
Agree	93 (42)	62 (41)	31 (43)	
Strongly agree	69 (31)	43 (28)	26 (36)	
I believe that ERAS/PSH are a reasonable investment of my time				
Missing	23 (10)	19 (13)	4 (6)	.416
Strongly disagree	0 (0)	0 (0)	0 (0)	
Disagree	0 (0)	0 (0)	0 (0)	
Neutral	37 (17)	27 (18)	10 (14)	
Agree	100 (45)	67 (44)	33 (46)	
Strongly agree	63 (28)	38 (25)	25 (35)	
I believe that ERAS/PSH improve/will improve the financial efficiency of our institution				
Missing	23 (10)	19 (13)	4 (6)	.267
Strongly disagree	0 (0)	0 (0)	0 (0)	
Disagree	1 (<1)	1 (<1)	0 (0)	
Neutral	47 (21)	32 (21)	15 (21)	
Agree	95 (43)	67 (44)	28 (39)	
Strongly agree	57 (26)	32 (21)	25 (35)	
ERAS/PSH are primarily designed to:				
Missing	24 (11)	20 (13)	4 (6)	.418
Attenuate the patient's response to surgical stress to improve LOS and reduce postoperative complications and mortality	25 (11)	13 (9)	12 (17)	
Improve the efficiency of the hospital and lead to improved financial return in a diagnosis related group payment system	12 (5)	9 (6)	3 (4)	
Address patient expectations preoperatively to lead to improved patient satisfaction	4 (2)	3 (2)	1 (1)	
All of the above	158 (71)	106 (70)	52 (72)	

Table 4

Knowledge and perception by role.

Variable, N (%)	Attending (N = 93)	Non-physician provider (N = 52)	Fellow/resident (N = 76)	*P* value
I have participated in the care of a patient in an ERAS/PSH protocol				
Missing	5 (5)	6 (12)	9 (12)	.050
Yes	38 (41)	22 (42)	42 (55)	
No	50 (54)	24 (46)	25 (33)	
I know _____ about ERAS/PSH				
Missing	5 (5)	6 (12)	9 (12)	.352
Nothing	13 (14)	7 (13)	9 (12)	
Very little	15 (16)	13 (25)	8 (11)	
Some	25 (27)	15 (29)	28 (37)	
Much	32 (34)	10 (19)	21 (28)	
Everything	3 (3)	1 (2)	1 (1)	
I believe ERAS/PSH are important for patient care				
Missing	6 (6)	6 (12)	9 (12)	.475
Strongly disagree	0 (0)	0 (0)	0 (0)	
Disagree	0 (0)	0 (0)	0 (0)	
Neutral	15 (16)	7 (13)	9 (12)	
Agree	38 (41)	25 (48)	39 (51)	
Strongly agree	34 (37)	14 (27)	19 (25)	
I believe that the hospital administration thinks ERAS/PSH are important for patient care				
Missing	6 (6)	6 (12)	9 (12)	.423
Strongly disagree	0 (0)	2 (4)	0 (0)	
Disagree	4 (4)	1 (2)	2 (3)	
Neutral	27 (29)	16 (31)	24 (32)	
Agree	41 (44)	21 (40)	32 (42)	
Strongly agree	15 (16)	6 (12)	9 (12)	
I believe my colleagues think ERAS/PSH are important for patient care				
Missing	6 (6)	6 (12)	9 (12)	.301
Strongly disagree	0 (0)	1 (2)	0 (0)	
Disagree	5 (5)	1 (2)	3 (4)	
Neutral	20 (22)	18 (35)	18 (24)	
Agree	50 (54)	18 (35)	34 (45)	
Strongly agree	12 (13)	8 (15)	12 (16)	
I believe that my patients have/will have improved care when they are involved in an ERAS/PSH				
Missing	6 (6)	6 (12)	9 (12)	.643
Strongly disagree	0 (0)	0 (0)	0 (0)	
Disagree	0 (0)	0 (0)	0 (0)	
Neutral	16 (17)	11 (21)	11 (14)	
Agree	37 (40)	22 (42)	34 (45)	
Strongly agree	34 (37)	13 (25)	22 (29)	
I believe that ERAS/PSH are a reasonable investment of my time				
Missing	6 (6)	6 (12)	9 (12)	.155
Strongly disagree	0 (0)	0 (0)	0 (0)	
Disagree	0 (0)	0 (0)	0 (0)	
Neutral	17 (18)	11 (21)	9 (12)	
Agree	37 (40)	26 (50)	37 (49)	
Strongly agree	33 (35)	9 (17)	21 (28)	
I believe that ERAS/PSH improve/will improve the financial efficiency of our institution				
Missing	6 (6)	6 (12)	9 (12)	.531
Strongly disagree	0 (0)	0 (0)	0 (0)	
Disagree	0 (0)	0 (0)	1 (2)	
Neutral	19 (20)	13 (25)	15 (20)	
Agree	38 (41)	23 (44)	34 (45)	
Strongly agree	30 (32)	10 (19)	17 (22)	
ERAS/PSH are primarily designed to:				
Missing	7 (8)	6 (12)	9 (12)	.270
Attenuate the patient's response to surgical stress to improve LOS and reduce postoperative complications and mortality	7 (8)	9 (17)	9 (12)	
Improve the efficiency of the hospital and lead to improved financial return in a diagnosis related group payment system	6 (6)	1 (2)	5 (7)	
Address patient expectations preoperatively to lead to improved patient satisfaction	2 (2)	2 (4)	0 (0)	
All of the above	71 (76)	34 (65)	53 (70)	

Table 5

Learning overall and by department.

Variable, N (%)	Overall (N = 223)	Surgery (N = 151)	Anesthesia (N = 72)	*P* value
Fluid management				
Missing	31 (14)	25 (17)	6 (8)	.365
1: Most interested	33 (15)	22 (15)	11 (15)	
2	34 (15)	19 (13)	15 (21)	
3	32 (14)	19 (13)	13 (18)	
4: Least interested	93 (42)	66 (44)	27 (38)	
Multimodal pain management				
Missing	32 (14)	27 (18)	5 (7)	.068
1: Most interested	68 (30)	39 (26)	29 (40)	
2	51 (23)	30 (20)	21 (29)	
3	63 (28)	49 (32)	14 (19)	
4: Least interested	9 (4)	6 (4)	3 (4)	
Minimalizing perioperative complications				
Missing	33 (15)	27 (18)	6 (8)	.518
1: Most interested	48 (22)	35 (23)	13 (18)	
2	65 (29)	42 (28)	23 (32)	
3	48 (22)	28 (19)	20 (28)	
4: Least interested	29 (13)	19 (13)	10 (14)	
Improving perioperative efficiency				
Missing	33 (15)	27 (18)	6 (8)	.055
1: Most interested	42 (19)	28 (19)	14 (19)	
2	43 (19)	35 (23)	8 (11)	
3	48 (22)	28 (19)	20 (28)	
4: Least interested	61 (27)	35 (23)	26 (36)	
My ideal method to learn about ERAS/PSH is _____:				
Missing	29 (13)	25 (17)	4 (6)	.643
Direct participation in institutional protocols	116 (52)	79 (52)	37 (51)	
Reviewing journal articles or text books	16 (7)	10 (7)	6 (8)	
Seminars or lectures on the topic from national leaders	20 (9)	13 (9)	7 (10)	
Seminars or lectures on the topic from local leaders	42 (19)	24 (16)	18 (25)	
Please select all that apply: I think the following upcoming health providers should receive formal education about ERAS/PSH as part of their training				
Surgeons				
Missing	29 (13)	25 (17)	4 (5)	.338
Yes	188 (84)	121 (80)	67 (93)	
No	6 (3)	5 (3)	1 (1)	
Anesthesia				
Missing	29 (13)	25 (17)	4 (5)	.714
Yes	187 (84)	121 (80)	66 (92)	
No	7 (3)	5 (3)	2 (3)	
Nursing				
Missing	29 (13)	25 (17)	4 (5)	.099
Yes	188 (84)	124 (82)	64 (89)	
No	6 (3)	2 (1)	4 (6)	
Please select all that apply: I think barriers to gaining knowledge about ERAS/PSH include:				
Lack of research				
Missing	29 (13)	25 (17)	4 (6)	.717
Yes	34 (15)	23 (15)	11 (15)	
No	160 (72)	103 (68)	57 (79)	
Lack of time				
Missing	29 (13)	25 (17)	4 (6)	.854
Yes	147 (66)	96 (64)	51 (71)	
No	47 (21)	30 (20)	17 (24)	
Lack of information provided by my employer				
Missing	29 (13)	25 (17)	4 (6)	.201
Yes	92 (41)	64 (42)	28 (39)	
No	102 (46)	62 (41)	40 (56)	
Lack of interest from patients				
Missing	29 (13)	25 (17)	4 (6)	.885
Yes	15 (7)	10 (7)	5 (7)	
No	179 (80)	116 (77)	63 (88)	
Lack of interest from providers				
Missing	29 (13)	25 (17)	4 (6)	.311
Yes	79 (35)	48 (32)	31 (43)	
No	79 (35)	48 (32)	31 (43)	
Please select one: ERAS/PSH should be _____:				
Missing	29 (13)	25 (17)	4 (6)	.358
Implemented broadly	100 (52)	68 (54)	32 (47)	
Focused on specific patient populations	94 (48)	58 (46)	36 (53)	

Respondents were asked to respond to the following prompt: "I am most interested in learning more about the following elements of ERAS/PSH (number 1 through 4 with 1 being most interested and 4 being least interested)".

Table 6

Learning by role.

Variable, N (%)	Attending (N = 93)	Non-physician provider (N = 52)	Fellow/resident (N = 76)	*P* value
Fluid management				
Missing	8 (9)	7 (13)	14 (18)	.110
1: Most interested	11 (12)	5 (10)	17 (22)	
2	13 (14)	9 (17)	12 (16)	
3	14 (15)	11 (21)	7 (9)	
4: Least interested	47 (51)	20 (38)	26 (34)	
Multimodal pain management				
Missing	8 (9)	7 (13)	15 (20)	.187
1: Most interested	33 (35)	20 (38)	15 (20)	
2	20 (22)	14 (27)	17 (22)	
3	29 (31)	10 (19)	24 (32)	
4: Least interested	3 (3)	1 (2)	5 (7)	
Minimalizing perioperative complications				
Missing	8 (9)	8 (15)	15 (20)	.345
1: Most interested	25 (27)	12 (23)	11 (14)	
2	29 (31)	18 (35)	18 (24)	
3	19 (20)	10 (19)	19 (21)	
4: Least interested	12 (13)	4 (8)	13 (17)	
Improving perioperative efficiency				
Missing	8 (9)	6 (12)	13 (17)	.062
1: Most interested	16 (17)	8 (15)	18 (24)	
2	23 (25)	4 (8)	16 (21)	
3	23 (25)	14 (27)	11 (14)	
4: Least interested	23 (25)	20 (38)	18 (24)	
My ideal method to learn about ERAS/PSH is _____:				
Missing	8 (9)	6 (12)	13 (17)	.390
Direct participation in institutional protocols	49 (53)	24 (46)	43 (57)	
Reviewing journal articles or text books	5 (5)	5 (10)	6 (8)	
Seminars or lectures on the topic from national leaders	10 (11)	4 (8)	6 (8)	
Seminars or lectures on the topic from local leaders	21 (23)	13 (25)	8 (11)	
Please select all that apply: I think the following upcoming health providers should receive formal education about ERAS/PSH as part of their training				
Surgeons				
Missing	8 (9)	6 (12)	13 (17)	.145
Yes	82 (88)	43 (83)	63 (83)	
No	3 (3)	3 (6)	0 (0)	
Anesthesia				
Missing	8 (9)	6 (12)	13 (17)	.103
Yes	83 (89)	42 (81)	62 (82)	
No	2 (2)	4 (8)	1 (1)	
Nursing				
Missing	8 (9)	6 (12)	13 (17)	.042
Yes	84 (90)	42 (81)	62 (82)	
No	1 (1)	4 (8)	1 (1)	
Please select all that apply: I think barriers to gaining knowledge about ERAS/PSH include:				
Lack of research				
Missing	8 (9)	6 (12)	13 (17)	.291
Yes	19 (20)	6 (12)	9 (12)	
No	66 (71)	40 (77)	54 (71)	
Lack of time				
Missing	8 (9)	6 (12)	13 (17)	.188
Yes	64 (69)	31 (60)	52 (69)	
No	21 (23)	15 (29)	11 (14)	
Lack of information provided by my employer				
Missing	8 (9)	6 (12)	13 (17)	.358
Yes	45 (49)	21 (40)	26 (34)	
No	40 (43)	25 (48)	37 (49)	
Lack of interest from patients				
Missing	8 (9)	6 (12)	13 (17)	.220
Yes	7 (8)	1 (2)	7 (9)	
No	78 (84)	45 (87)	56 (74)	
Lack of interest from providers				
Missing	8 (9)	6 (12)	13 (17)	.121
Yes	29 (31)	18 (35)	32 (42)	
No	56 (60)	28 (54)	31 (41)	
Please select one: ERAS/PSH should be _____:				
Missing	8 (9)	6 (12)	13 (17)	.250
Implemented broadly	48 (52)	19 (41)	33 (53)	
Focused on specific patient populations	37 (40)	27 (59)	30 (48)	

Respondents were asked to respond to the following prompt: "I am most interested in learning more about the following elements of ERAS/PSH (number 1 through 4 with 1 being most interested and 4 being least interested)".

(N=68), followed by minimizing perioperative complications (22%, N=48). More than half of respondents reported their ideal method to learn about ERAS/PSH is direct participation in institutional protocols (52%, N=116). Fewer preferred seminars or lectures from local (19%, N=42) or national leaders (9%, N=20), and even less preferred reviewing journal articles or textbooks (7%, N=16). Despite an apparent personal preference for non-structured "on-the-job" learning, the majority of respondents felt that forthcoming health providers in surgery (84%, N=188), anesthesiology (84%, N=187), and nursing (84%, N=188) should receive formal instruction about ERAS/PSH as part of their training. Participants indicated that the 2 most significant barriers to gaining knowledge about ERAS/PSH are lack of time (66%, N=147) and lack of information provided by their employer (41%, N=92).

4. Discussion

The objective of this study was to evaluate the perception, knowledge and learning preferences of perioperative clinicians from surgery and anesthesiology regarding ERAS and PSH protocols. We included attending and postgraduate physicians, surgical nurse practitioners and certified registered nurse anesthetists at a large academic medical center. Overall, about half of survey participants had provided care to a patient on an ERAS/PSH protocol, and a majority felt at least somewhat knowledgeable about ERAS/PSH protocols. Perception of the value of ERAS/PSH was positive, and respondents were enthusiastic about learning more and participating in the care of patients on ERAS/PSH protocols.

There are published surveys of providers related to ERAS, but to our knowledge, the work presented here is the first assessing perceptions, knowledge, and learning preferences in providers from different fields, practice environments, and levels of experience. Hughes et al[22] surveyed both patients and providers on which components of ERAS are the most important. The components rated the highest in their survey were freedom from nausea and pain at rest, while those rated the lowest were early return of bowel function and preanesthetic sedation, but both groups supported ERAS principles, in general. Similarly, most participating providers at our institution reported they agree or strongly agree that ERAS/PSH is important for patient care, and they perceive that the hospital administration and their colleagues believe ERAS/PSH is important for patient care. Furthermore, our respondents believe that patients have or will have improved care when they are involved in an ERAS/PSH protocol. Successful implementation of ERAS/PSH at an institution requires significant culture change, and the perceived value of ERAS/PSH is a very encouraging result of our survey.

Our survey data identified interest in continued learning about ERAS/PSH, despite more than 50% of respondents indicating that they knew "some" or "much" about ERAS/PSH. Interestingly, multimodal pain management was the topic of greatest interest, not only in the Department of Anesthesiology, but also the Department of Surgery. Though decreased fasting times have been widely embraced as part of ERAS/PSH at our institution, intraoperative and postoperative fluid management components of our ERAS/PSH protocols are less adhered-to than other components (data not shown). It is unclear why interest in learning more about fluid management is so poor, but this insight presents an opportunity to further work on our culture change for ERAS/PSH.

Importantly, our study identified lack of information and lack of time as the most significant barriers to gaining knowledge about ERAS/PSH. These will need to be specifically addressed for continued growth and success of ERAS/PSH. Traditional lectures and literature review were not favored methods of learning for respondents. Despite a desire to learn from "on-the-job" experiences, the majority of respondents felt that upcoming health providers in surgery, anesthesia, and nursing should receive formal education about ERAS/PSH as part of their training, indicating that the value of structured educational opportunities is recognized by survey participants. In the future, we plan to explore teaching methods that successfully engage participants and also overcome the lack of time and information barriers identified by study participants. Computer-based learning modules can be designed with interactive components to avoid exclusively passive learning and can be completed on a flexible timeline. Another teaching tool we plan to implement is regular compliance reports so practitioners can see how their execution, or lack thereof, of various protocol elements impacts patient outcomes and other quality, efficiency, and cost metrics. We anticipate feedback of this nature will be a powerful motivator to address knowledge deficits.

Our survey data revealed that providers affiliated with the Department of Anesthesia more commonly reported having cared for a patient in an ERAS/PSH protocol (71% compared to 34% of providers affiliated with the Department of Surgery). In context of the environment at our institution, this makes sense given that only a few ERAS protocols were introduced at the time of the survey. Specific individuals associated with the Department of Surgery have worked with these patient populations, while other have not. Anesthesia providers commonly rotate among different areas and get a broader exposure to different patient populations. In accordance, providers in the Department of Surgery also reported less baseline knowledge compared to Anesthesiology colleagues. As future protocols are introduced, the Department of Surgery will have expanded educational opportunities from direct participation in ERAS/PSH, which was the favored method for gaining knowledge expressed by survey participants. This learning preference emphasizes the enthusiasm of surgery and anesthesiology providers at our institution for active participation in ERAS/PSH initiatives. Hospital and clinical leadership can be supportive by providing accessible and detailed information about ERAS/PSH protocols and time to prioritize care required by protocols to combat the prominent barriers to increased ERAS/PSH knowledge indicated by survey responses. Another way to participate in protocols directly is to be active in their development. A foundational goal of ERAS/PSH is to build multidisciplinary teams focused on perioperative patient care, and our data support that different types of clinical providers with varying levels of experience are fairly aligned in their perceptions and expectations of ERAS/PSH programs which can facilitate productive team dynamics.

There are important considerations when interpreting the data presented here. By using an online survey we were able to contact large populations of faculty physicians, advanced practice providers, and physician trainees; however survey-based research has inherent limitations. The response rate to this survey was 25%, with only 21% of respondents completing the entire questionnaire. Physicians have notoriously low response rates to surveys.[23,24] Our survey was administered as one version to all respondents, despite many different types of care-team members being included. In the future, we plan to have shorter,

personalized surveys for each clinical role and offer incentives for completion to increase response rates. Additionally, there are no validated survey tools available on the topics of knowledge, learning preferences, and perception regarding ERAS. We therefore designed our own survey tool. The results of this study, which was conducted at a large, academic, tertiary care center, may not be generalizable to other institutions, which may need to conduct similar studies to tailor results to their institution. Furthermore, more surgical trainees than anesthesiology trainees participated. Nursing serves a critical role in the implementation of ERAS/PSH protocols and surveying their perceptions, knowledge, and preferred learning methods would have been a valuable addition to this study. Our work does show that a simple assessment tool can be used to gain important information from providers that can help guide improvements to ERAS/PSH delivery in the future.

5. Conclusion

As we plan to expand the number of ERAS/PSH protocols to a wide variety of procedures at our institution, we felt evaluating the perception and knowledge of providers, in addition to the preferred methods of learning and barriers, was critical to identifying opportunities for further engagement and information sharing. Our respondents felt their colleagues and institution were supportive of ERAS/PSH, that patients involved in ERAS/PSH protocols have improved care and furthermore, ERAS/PSH protocols will improve the financial efficiency of the institution. Providers were most interested in learning about multimodal pain management and minimizing perioperative complications, and generally preferred to learn by direct participation in institutional protocols, rather than by participating in seminars and lectures on this topic from local or national leaders or reviewing the literature independently. Respondents felt that lack of time and lack of information provided by their employer were the most significant obstacles to increased knowledge about ERAS/PSH protocols. While respondents preferred to learn about ERAS/PSH protocols by direct participation, a significant majority felt that upcoming health providers should receive formal education as part of their training. Therefore we advocate for expansion of didactic education regarding ERAS/PSH, involvement of trainees in protocol development, as well as on-the-job training, and interactive, as opposed to passive, learning modalities for providers taking care of patients on ERAS/PSH protocols.

Author contributions

Conceptualization: Eliza W. Beal, Zachary Denham, Michelle L. Humeidan.
Data curation: Eliza W. Beal, Joshua-Paolo C. Reyes, Zachary Denham, Michelle L. Humeidan.
Formal analysis: Eliza W. Beal, Joshua-Paolo C. Reyes, Mahmoud Abdel-Rasoul.
Investigation: Eliza W. Beal, Joshua-Paolo C. Reyes, Zachary Denham, Michelle L. Humeidan.
Methodology: Eliza W. Beal, Michelle L. Humeidan.
Project administration: Michelle L. Humeidan.
Supervision: Michelle L. Humeidan.
Writing – original draft: Eliza W. Beal, Michelle L. Humeidan, Zachary Denham.
Writing – review & editing: Eliza W. Beal, Joshua-Paolo C. Reyes, Eyad Rasoul, Michelle L. Humeidan.

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