OPEN

Use of Telemedicine for Postdischarge Assessment of the Surgical Wound

International Cohort Study, and Systematic Review With Meta-analysis

NIHR Global Health Research Unit on Global Surgery, GlobalSurg Collaborative

Objective: This study aimed to determine whether remote wound reviews using telemedicine can be safely upscaled, and if standardized assessment tools are needed.

Background: Surgical site infection (SSI) is the most common complication of surgery worldwide, and frequently occurs after hospital discharge. Evidence to support implementation of telemedicine during postoperative recovery will be an essential component of pandemic recovery.

Methods: The primary outcome of this study was SSI reported up to 30 days after surgery (SSI), comparing rates reported using telemedicine (telephone and/or video assessment) to those with in-person review. The first part of this study analyzed primary data from an international cohort study of adult patients undergoing abdominal surgery who were discharged from hospital before 30 days after surgery. The second part combined this data with the results of a systematic review to perform a meta-analysis of all available data conducted in accordance with PRIMSA guidelines (PROSPERO:192596).

Results: The cohort study included 15,358 patients from 66 countries (8069 high, 4448 middle, 1744 low income). Of these, 6907 (45.0%) were followed up using telemedicine. The SSI rate reported using telemedicine was slightly lower than with in-person follow-up (13.4% vs 11.1%, $P<0.001$), which persisted after risk adjustment in a mixed-effects model (adjusted odds ratio: 0.73, 95% confidence interval: 0.63–0.84, $P<0.001$). This association was consistent across sensitivity and subgroup analyses, including a propensity-score matched model. In 9 eligible nonrandomized studies identified, a pooled mean of 64% of patients underwent telemedicine follow-up. Upon meta-analysis, the SSI rate reported was lower with telemedicine (odds ratio: 0.67, 0.47–0.94) than in-person (reference) follow-up ($I^2=0.45$, $P=0.12$), although there a high risk of bias in included studies.

Conclusions: Use of telemedicine to assess the surgical wound post-discharge is feasible, but risks underreporting of SSI. Standardized tools for remote assessment of SSI must be evaluated and adopted as telemedicine is upscaled globally.

Keywords: surgical site infection, surgical complications, global surgery, global health, research methodology, outcome assessment

(*Ann Surg* 2023;277:e1331–e1347)

From the NIHR Global Health Research Unit on Global Surgery, Institute of Translational Medicine, University of Birmingham, Birmingham, B152TH, United Kingdom.

✉j.glasbey@bham.ac.uk.

Collaborating authors listed at the end of this manuscript (PubMed citable).

This report was funded by a DFID-MRC-Wellcome Trust Joint Global Health Trial Development Grant (MR/N022114/1) and National Institute for Health Research (NIHR) Global Health Research Unit Grant (NIHR 16.136.79). The lead author (J.G.) is supported by an NIHR Doctoral Research Fellowship (DRF/100375). The funder had no role in study design, data collection, analysis and interpretation, or writing of this report. The funder has approved the submission of this report for publication. The views expressed are those of the authors and not necessarily those of the National Health Service, the NIHR, or the UK Department of Health and Social Care.

The authors report no conflicts of interest.

Supplemental Digital Content is available for this article. Direct URL citations are provided in the HTML and PDF versions of this article on the journal's website, www.annalsofsurgery.com.

ISSN: 0003-4932/23/27706-e1331

DOI: 10.1097/SLA.0000000000005506

Telemedicine has now become a core component of health service delivery. During COVID-19 outbreaks, patients have been encouraged not to return to hospital for in-person assessment after surgery due to fear of SARS-CoV-2 transmission.[1–4] Use of telemedicine in surgical follow-up has rapidly increased, but without opportunity for detailed evaluation.[5–7] If telemedicine assessment is not standardized it risks underreporting or misidentification of complications, and harm for patients. Better understanding the capacity to deliver telemedicine in the surgical setting and the accuracy of remote assessment for common complications will be fundamental to the pandemic recovery effort.[8,9] This may be particularly important in low-resource settings where, even prepandemic, patients had to travel longer distances to hospital and risk catastrophic expenditure as a result of a surgical episode.[10]

Surgical site infection (SSI) is the most common complication of surgery, with a high burden of morbidity, detriment to quality of life and economic consequences for both patients and providers.[11–14] It has global impact with variation in risk across settings.[15] SSI often presents after patients' have left hospital after surgery.[16] The current accepted standard in SSI assessment requires an in-person review by an appropriately trained clinician, according to US Centre for Disease Control Criteria (CDC).[17] In accordance with this framework, patients must travel back to hospital as an outpatient, or for a clinician to visit them in the community. While telemedicine is an attractive target for assessment of the surgical wound, the evidence for its adoption remains limited. Quality of wound assessment is proportionate to the reported rate of SSI.[18,19] Even in randomized trials, where SSI is a secondary rather than primary outcome the reported rate of SSI is twice as low.[18] Unstandardized telemedicine assessment therefore risks delay to timely intervention and introduction of research bias.[20,21]

The aims of this cohort study, and systematic review with meta-analysis were to whether telemedicine wound assessment in feasible across different settings, and to compare the rates of SSI reported using telemedicine and in-person follow-up.

METHODS

Part 1. Cohort Study

This was a preplanned, secondary analysis of a prospective, international, multicenter cohort study conducted across the GlobalSurg Collaborative network (GlobalSurg-2).[22] Detailed methodology for the study has been previously published.[15] Each contributing institution sought and obtained ethical and institutional approval according to local regulations. This study was registered with ClinicalTrials.gov (NCT02662231).

Inclusion and Exclusion Criteria

Any center performing elective and/or emergency abdominal surgery was invited to participate. Local investigators used consecutive sampling to include all patients undergoing elective (planned) or emergency (unplanned) gastrointestinal resection within discrete 2-week periods. Both open and minimally invasive approaches were eligible. Both adults and children (of any age) were eligible for inclusion. Patients were excluded where the primary identification for surgery was vascular, gynecological, obstetric, urological, or for transplantation.

Data Variables and Data Collection

Data were collected using a secure, password-encrypted, web-hosted Research Electronic Data Capture (REDCap) system. Participating centres were grouped into tertiles according to the United Nation's Human Development Index (HDI). A full description of the data variables collected is available in the primary report of this study.[15] Data variables were chosen pragmatically to be objective, easily standardized and internationally relevant to minimize missing data and maximize data quality. Independent data validation was performed for case ascertainment and data accuracy.

Classification of Follow-up Method

Investigators were asked to actively monitor patients up to 30-day after surgery, and performed an assessment for SSI at 30-days after surgery by 1 of 3 methods: (1) telemedicine review (telephone and/or video assessment), which was not standardized in the study, but was performed according to local practice and informed by CDC criteria; (2) in-person clinical review, either during an outpatient clinic appointment or a community visit in accordance with CDC criteria; (3) inpatient only, with in-hospital assessment and review of patient notes and electronic records up to 30 days after surgery (ie, no contact made after discharge). Patients that remained an inpatient at 30 days postoperatively were excluded from analysis (including those that were readmitted and were in hospital at 30 days after surgery). Patients that were readmitted and discharged before 30 days after surgery had an independent 30-day assessment of their SSI status.

Outcome Measures

The primary outcome measure was SSI reported up to 30 days after surgery defined according to the US Centre for Disease Control criteria.[14] We included both superficial and deep infections but excluded organ space infection, which has a different biological mechanism (eg, anastomotic leak, gross contamination). Training in the CDC criteria for SSI diagnosis was provided to all investigators using an online training module. The secondary outcome measure was 30-day postoperative mortality rate with day 0 as the day of surgery.

Statistical Analysis

Differences in characteristics and the reported rates of SSI between telemedicine, in-person and inpatient only follow-up were tested with the Pearson χ^2 test for categorical variables and with the Kruskal-Wallis test for continuous variables. There is likely to be variation in the methods of adoption of telemedicine across different resource settings. Global variation was explored by stratifying comparisons between high-HDI, middle-HDI and low-HDI countries to explore whether patterns were consistent across health systems. Multilevel logistic regression models were constructed to explore associations between the method of follow-up and the SSI rate reported. Characteristics and outcomes of patients with no postdischarge assessment (inpatient only) were described for transparency, but were excluded from multivariable modelling. Adjustment for case mix was performed using patient, disease and operation-specific factors, informed by a casual model constructed to inform covariable selection and presented using a directed acyclic graph (DAG). Country was incorporated as random effects with a constrained gradient. Discrimination of the model was determined using the *c*-statistic (area under the receiver operating curve characteristic). Model coefficients were presented as adjusted odds ratios (OR) with 95% confidence intervals (CI). To account for death after surgery as a competing risk, patients who died before 30-day follow-up were excluded in a sensitivity analysis of the primary analysis. A second sensitivity analysis was conducted including only patients with a postoperative length of stay of 14 days or less. A third sensitivity analysis included elective cancer surgery only. The final sensitivity analysis was performed in propensity score matched groups to address a risk of selection bias and counterfactuals[23,24] (full methodology in *Appendix A*). Subgroup analyses were performed for the primary analysis across high versus middle or low HDI countries. To explore risk of reverse causation (ie, patients with serious postoperative complications seeking in-person review) we looked for associations between follow-up method and 30-day postoperative mortality rate. All analyses were done using the R Foundation Statistical Program version 4.1.1 (Auckland, New Zealand) (packages: finalfit, tidyverse, boot, MatchIt, cem, randomForests).

Part 2. Systematic Review and Meta-analysis

A systematic database search was performed according to a prepublished protocol (PROSPERO:192596) and followed Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA) guidance. Studies reporting SSI rates detected using telemedicine and in-person assessment after noncardiac surgery were included. Data extracted from published studies was combined with cohort data and a meta-analysis performed with all available data.

Database Search and Report Characteristics

A search strategy was constructed using Medline, EMBASE, and PubMed to identify 2 key concepts within published literature: (1) SSI and (2) telemedicine. The full search strategy for the review is available in the *Appendix B.* All included studies assessed a proportion of patients both by telemedicine and in-person follow-up. The full inclusion and exclusion criteria are reported in *Appendix C.*

Outcome Measures

The primary outcome measure was the rate of SSI reported up to 30 days after surgery in the study. In the meta-analysis, this was defined pragmatically according to any classification system adopted (US CDC, ASEPSIS or Public Health England), or diagnosis by a clinician. The secondary outcome measure was the proportion of patients undergoing telemedicine versus in-person follow-up.

Data Extraction and Analysis

Full texts were retrieved for all studies that potentially met the inclusion criteria. Any disagreement on eligibility of studies was resolved through consensus discussion with a third reviewer. Data on the proportion of patients with an SSI reported by telemedicine and by in-person follow-up, and the proportion of patients that underwent telemedicine follow-up were extracted from eligible study, and combined with data from the cohort study in *Part 1*. Data extraction was performed and cross-checked for accuracy by 2 reviewers.

Data analysis was performed using R Foundation Statistical Program version 3.1 (packages: meta, metabin). Outcome measures were quantitatively summarized where data were available. Firstly, meta-analysis performed to estimate the pooled mean proportions of patients followed-up using telemedicine. Secondly, meta-analysis was performed to compare the reported SSI rates with telemedicine and in-person follow-up. Heterogeneity among study estimates was quantified using the I^2 and an associated test for heterogeneity. As heterogeneity was likely to be high, the DerSimonian and Laird random effects (RE) method was used to pool estimates, with inverse-variance weights. A subgroup analysis was performed of data from high versus low and middle-income countries (packages: metaprop, meta).

Risk of Bias Assessment

Risk of bias was assessed for nonrandomized studies using the ROBINS-I tool. As this was not a clinical effectiveness study, a GRADE level of evidence assessment was not deemed to be required.

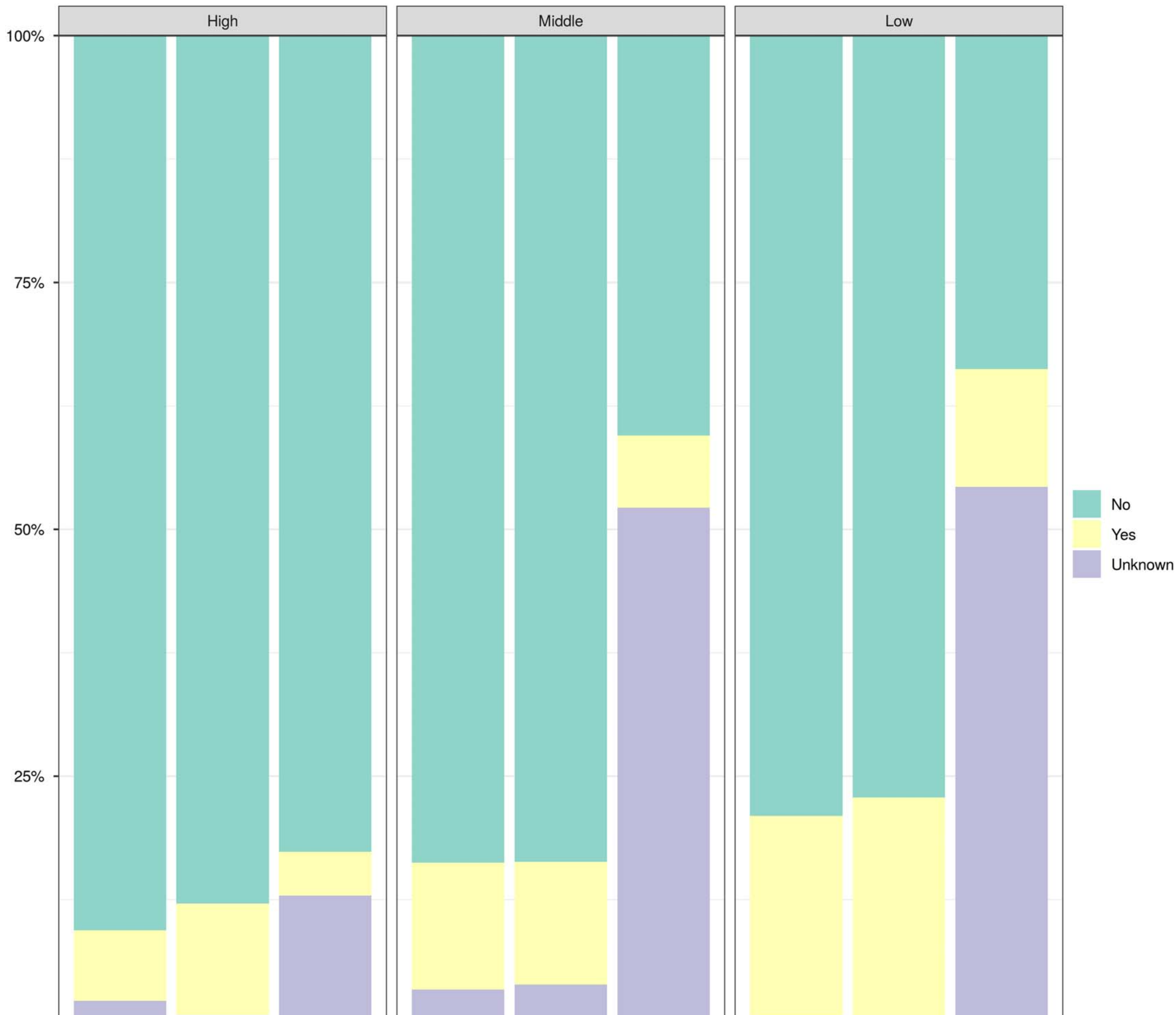

FIGURE 1. Surgical site infection rates by method of follow-up across high-income, middle-income and low-income settings.

TABLE 1. Patient, Disease and Operation-specific Factors Grouped by Follow-up Strategy

Factor	Levels	Telemedicine	In-person Review	Inpatient Only	*P*
Total		6479 (44.6)	5847 (40.2)	2206 (15.2)	—
HDI tertile	High	3113 (36.7)	3823 (45.0)	1556 (18.3)	< 0.001
	Middle	3075 (61.4)	1358 (27.1)	573 (11.4)	
	Low	719 (38.7)	990 (53.2)	151 (8.1)	
Age group	< 20	1003 (46.6)	823 (38.2)	326 (15.1)	< 0.001
	20–39	2332 (47.9)	1737 (35.7)	802 (16.5)	
	40–59	1967 (45.9)	1710 (39.9)	608 (14.2)	
	60–79	1312 (40.5)	1482 (45.8)	444 (13.7)	
	80–100	154 (31.8)	261 (53.8)	70 (14.4)	
Sex	Male	2865 (41.8)	2991 (43.7)	995 (14.5)	< 0.001
	Female	3614 (47.1)	2856 (37.2)	1211 (15.8)	
ASA grade	I	3363 (49.9)	2390 (35.5)	986 (14.6)	< 0.001
	II	2366 (41.6)	2451 (43.1)	868 (15.3)	
	III	800 (37.9)	1026 (48.6)	287 (13.6)	
	IV	102 (34.5)	143 (48.3)	51 (17.2)	
	V	37 (44.0)	37 (44.0)	10 (11.9)	
Smoker	Never smoked	4786 (48.6)	3757 (38.1)	1310 (13.3)	< 0.001
	Current smoker	1063 (46.7)	883 (38.8)	330 (14.5)	
	Ex-smoker	655 (40.9)	741 (46.3)	206 (12.9)	
Pathology	Malignancy	742 (34.6)	1191 (55.6)	210 (9.8)	< 0.001
	Other abdominal	1536 (41.0)	1727 (46.1)	487 (13.0)	
	Infection	111 (38.0)	147 (50.3)	34 (11.6)	
	Appendicitis	2083 (47.9)	1483 (34.1)	785 (18.0)	
	Gallstone disease	2344 (51.1)	1504 (32.8)	742 (16.2)	
	Congenital	88 (38.9)	118 (52.2)	20 (8.8)	
Urgency	Elective	3382 (46.9)	2962 (41.1)	871 (12.1)	< 0.001
	Semielective	286 (38.3)	375 (50.3)	85 (11.4)	
	Emergency	3239 (43.8)	2834 (38.3)	1322 (17.9)	
Contamination	Clean-contaminated	5713 (47.2)	4563 (37.7)	1818 (15.0)	< 0.001
	Contaminated	681 (36.9)	915 (49.5)	251 (13.6)	
	Dirty	479 (38.6)	596 (48.0)	167 (13.4)	
WHO checklist	No	2633 (60.6)	1310 (30.1)	404 (9.3)	< 0.001
	Yes	4198 (38.9)	4771 (44.2)	1829 (16.9)	

P values are derived from χ^2 testing for categorical data.
ASA indicates American Society of Anaesthesiology; WHO, World Health Organisation.

RESULTS

Part 1. Cohort Study

Methods of Postdischarge Follow-up

Overall, 15358 of 16015 patients (95.9%) were discharged before 30 days postoperatively and were included in this analysis. Of these patients, 6907 underwent telemedicine review (45.0%), 6171 in-person review (40.2%), and 2280 inpatient only assessment (14.8%).

Use of Telemedicine

Telemedicine was used across 51 of 66 contributing countries spanning high (n = 23), middle (n = 16) and low-HDI (n = 12) settings (Fig. 1). In high-HDI settings 36.7% (3113/8492) of included patients were followed-up using telemedicine. The telemedicine follow-up rates were higher in both middle-HDI (61.4%, 3075/5006), and low-HDI settings (38.7%, 719/1860). Telemedicine was used for patients of both sexes (41.8%, of male patients, and 47.1% of female patients) and all age ranges, including both the youngest (2–20 year; 46.6%, 1003/2151) and oldest age groups (80–100 year; 31.8%, 154/485). Telemedicine was used to follow-up patients with a range of American Society of Anaesthesiology grades, underlying pathologies and presenting for both elective and emergency care (Table 1).

Characteristics of Patients by Follow-up Group

There were significant differences in the baseline risk characteristics of the groups that underwent telemedicine, in-person, and inpatient only follow-up. Notably, patients that underwent surgery for malignancy were less likely to have telephone review than in-person clinical review (34.6% vs 55.6%, $P < 0.001$). Patients undergoing emergency surgery were more likely to have telephone review than clinical review (43.8% vs 38.3%, $P < 0.001$). Patients from high income countries ($P < 0.001$), with gallstone disease or appendicitis as their indication for surgery ($P < 0.001$), or that underwent emergency surgery ($P < 0.001$) were most likely to have inpatient only assessment.

Reporting of SSI

In this study, 11.2% (1721/15358) of patients had an SSI reported, and 5.5% (843/15358) had an unknown SSI status. The rate of SSI reported was slightly lower with telemedicine (11.1%, 766/6907) and lower with inpatient only follow-up (5.7%, 129/2280) than with in-person follow-up (13.4%, 826/6171, $P < 0.001$). Of patients that had SSI reported, 44.5% (766/1721) of diagnoses were made using telemedicine, 48.0% (826/1721) in-person, and 7.5% (129/1721) with inpatient only assessment.

Figure 1 shows the unadjusted SSI rates by method of follow-up, stratified by HDI tertile. "Unknown" SSI status was higher in groups undergoing inpatient only assessment than telephone review or in-person clinical review groups; this difference was largest across middle-HDI and low-HDI settings ($P < 0.001$). Small differences were observed in reported SSI rates (unadjusted) following

TABLE 2. Observed Rates of Surgical Site Infection by Follow-up Strategy and Contamination Strata

Follow-up Method	Clean-contaminated, n/N (%)	Contaminated, n/N (%)	Dirty, n/N (%)
Overall	1151/12411 (9.3)	455/1984 (22.9)	367/1382 (26.6)
All included countries			
Telemedicine	514/5713 (9.0)	146/680 (21.5)	104/479 (21.7)
In-person	424/4440 (9.5)	225/905 (24.9)	160/581 (27.5)
Inpatient only	84/1814 (4.6)	22/246 (8.9)	19/166 (11.4)
Low and middle HDI countries only			
Telemedicine	171/1563 (10.9)	126/428 (29.4)	94/265 (35.4)
In-person	365/3014 (12.1)	104/419 (24.8)	74/162 (45.7)
Inpatient only	28/239 (11.7)	16/58 (27.6)	15/41 (36.5)

telemedicine and in-person review across high-HDI [7.3% (222/3043) vs 11.4% (432/3793)], middle-HDI [13.3% (396/2971) vs 12.9% (169/1305)] and low-HDI [20.7% (148/716) vs 22.8% (225/989)] countries. Unadjusted SSI rates with telephone follow-up and in-person clinical follow-up were comparable across strata of intra-abdominal contamination (Table 2, Supplementary Fig. 1, Supplemental Digital Content 1, http://links.lww.com/SLA/D998). Inpatient only assessment had a lower recorded rate of SSI in high-income settings [5.1% (69/1355)], but a higher rate of SSI reported in middle-income [15.3% (42/274)], and low-income settings [26.1% (18/69)], respectively.

Our proposed casual model is displayed in Figure 2. Upon univariable analysis, the odds of reporting an SSI following telemedicine assessment (OR: 0.81, 0.73–0.90, $P<0.001$) was lower than in-person (reference). After multivariable adjustment telemedicine assessment was associated with lower odds of reporting SSI than in-person review (OR: 0.73, 0.64–0.84, $P<0.001$, Fig. 3). This was consistent in sensitivity analyses including patients that were alive at 30 days after surgery only (Supplementary Table 2, Supplemental Digital Content 1, http://links.lww.com/SLA/D998) that had a postoperative length of stay of 14 days or less (Supplementary Table 3, Supplemental Digital Content 1, http://links.lww.com/SLA/D998), elective cancer surgery only (Supplementary Table 4, Supplemental Digital Content 1, http://links.lww.com/SLA/D998) propensity score matched analysis (Supplementary Tables 5 and 6, Supplemental Digital Content 1, http://links.lww.com/SLA/D998), and on subgroup analysis by HDI group (Supplementary Fig. 2, Supplemental Digital Content 1, http://links.lww.com/SLA/D998). Whilst there was a higher 30-day POMR in patients that underwent in-person review than telemedicine review in unadjusted data (1.3%, 81/6056 versus 1.0%, 70/6721), there was no significant association between follow-up method and POMR in the adjusted model (Supplementary figure 3).

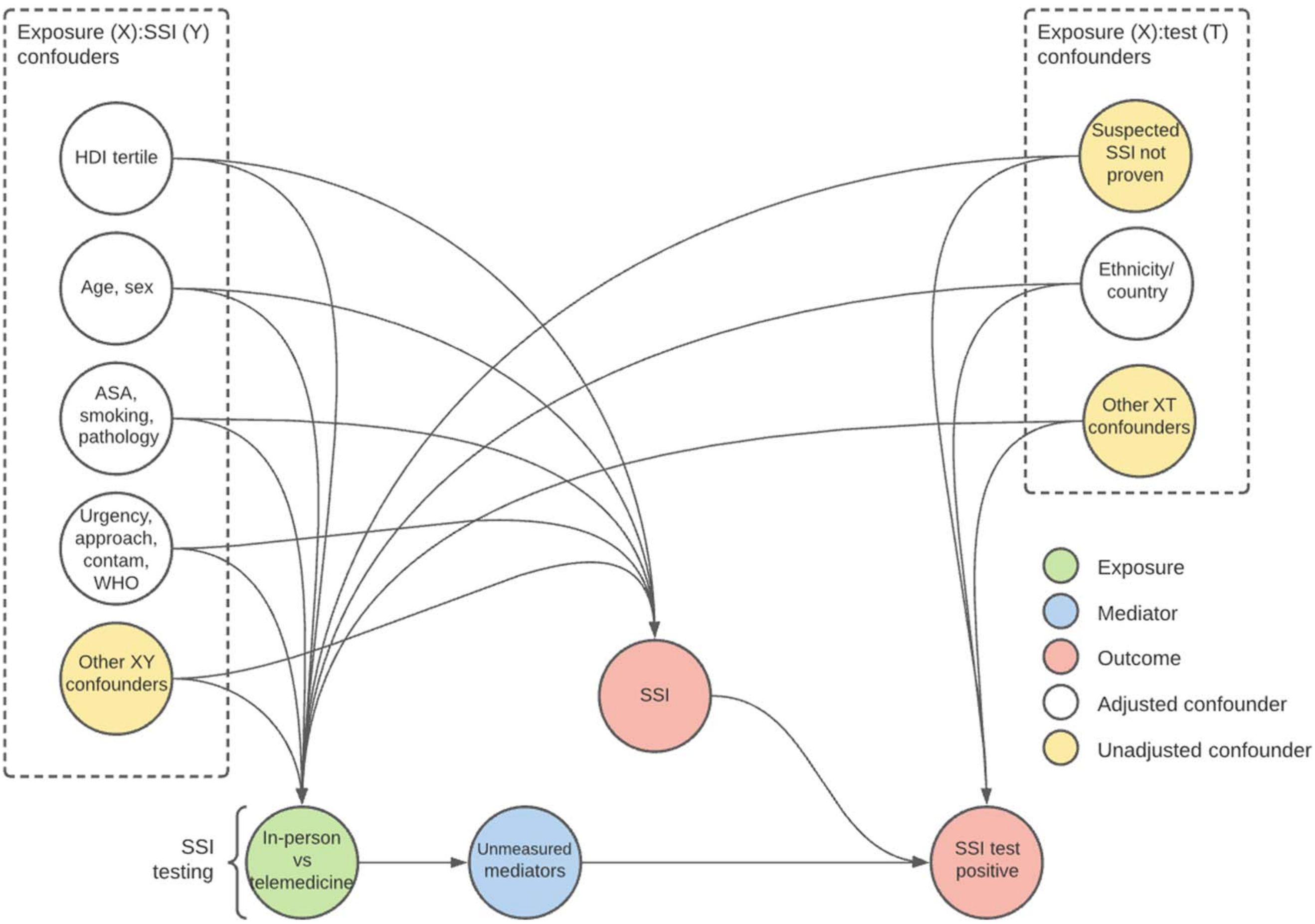

FIGURE 2. Directed acyclic graph displaying casual model between method of follow-up and SSI test positive (observed SSI).

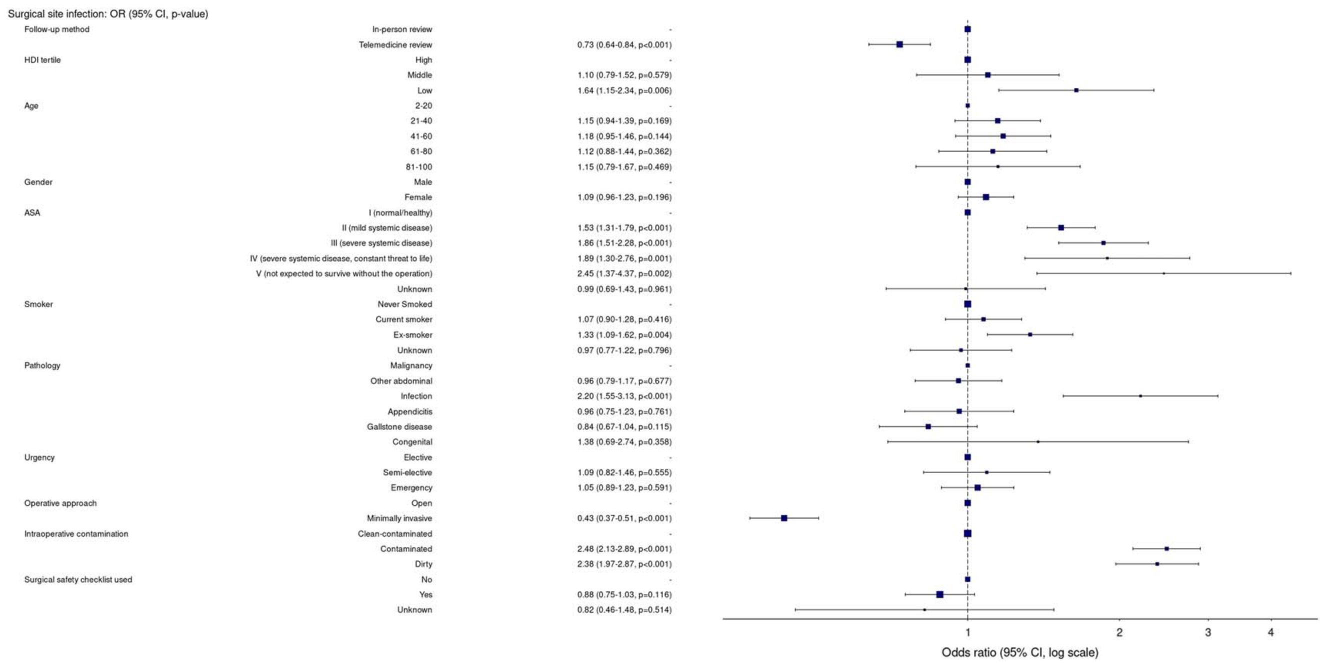

FIGURE 3. Forest plot of factors associated with reporting of postdischarge surgical site infection after abdominal surgery. A lower odds ratio conveys a lower adjusted odds of reporting a surgical site infection (ie, assumed to be under-detection of the true SSI rate). ASA indicates American Society of Anaesthesiology; WHO, World Health Organisation (Full model presented in Supplementary Table 1 Supplemental Digital Content 1, http://links.lww.com/SLA/D998).

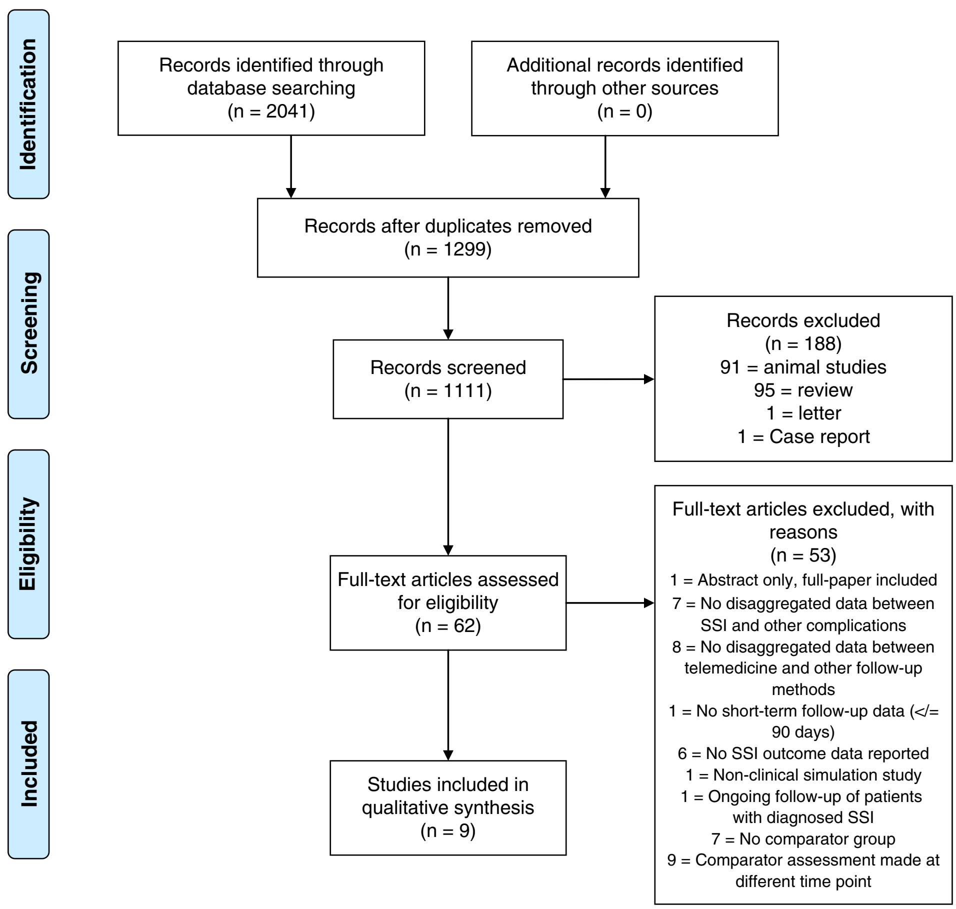

FIGURE 4. PRISMA flowchart of studies included in meta-analysis.

TABLE 3. Rates of SSI Detected by In-person and Telemedicine Follow-up in Published Studies

References	Operation Types	HDI	SSI (Telemedicine)	Patients (Telemedicine)	Telephone Assessment	SSI (Comparator)	Patients (Comparator)	Comparator Assessment	Within patient Measurement
Comparison to in-person follow-up									
Abu-Sheasha et al[25]	All	Middle-income	34	254	PHE	32	309	Non-CDC	Paired
Pathak et al [26]	General surgery	Middle-income	10	380	Not stated	24	156	CDC	Unpaired
McIntyre et al[27]	Trauma	High-income	9	112	CDC	4	29	CDC	Unpaired
Reilly et al[28]	Orthopedics	High-income	8	105	CDC	6	105	CDC	Paired
Comparisons to other follow-up methods									
Bediako-Bowan et al[29]	General surgery	Middle-income	35	3007	PHE	161	1438	EHR	Unclear
Burlingame et al[30]	Obstetrics	High-income	45	868	Not stated	24	868	EHR	Unclear
Golub et al[31]	General surgery	Middle-income	17	100	Not stated	15	100	EHR	Unclear
Pham et al[32]	Noncardiac	Highincome	122	2853	Not stated	67	2853	EHR	Paired
Petrosillo et al[33]	General surgery, Gynecology	High-income	62	4041	CDC	31	184	Postal questionnaire	Unpaired
GlobalSurg cohort study data									
GlobalSurg Collaborative 15	General surgery	All	766	5964	Not stated	826	5261	In-person (CDC)	Unpaired
High income		High-income	222	2821	Not stated	432	3361	In-person (CDC)	Unpaired
Middle income		Middle-income	396	2575	Not stated	169	1136	In-person (CDC)	Unpaired
Low income		Low-income	148	568	Not stated	225	764	In-person (CDC)	Unpaired

PHE indicates Public Health England; EHR, Electronic Health Record.

Systematic Review and Combined Meta-analysis

Search Results

From 1299 deduplicated search results, 25 full papers reported an SSI rate detected using telemedicine. 28.0% had no comparator group (7/25), and 36.0% (9/25) compared telemedicine to assessment at a different time point (eg, in-hospital vs 30-day telemedicine assessment). Nine eligible studies were therefore included.[25–33] Summary data from the cohort study in *Part 1* was combined with these 9 studies for qualitative synthesis (Fig. 4).

Study Characteristics

Of the included studies, 66.7% (6/9) were published within the last 5 years (2015–2020).[25,26,29–32] Eight were prospective cohort studies, with 1 retrospective study.[30] Most reported data from high-income countries (55.6%, 5/9)[27,28,30,32,33]; 1 was from an upper-middle income country[31] and 3 from lower-middle income countries.[25,26,29] No data from low-income countries or multi-country studies were reported. Of included articles, 44.4% (4/9) reported outcome assessment in patients undergoing general surgery,[26,29,31,33] 22.2% (2/9) in trauma and orthopedics,[27,28] 11.1% (1/9) in obstetric surgery,[30] and 22.2% (2/9) in all noncardiac surgery.[25,32] There was a moderate or severe risk of bias in all included studies (Supplementary Fig. 4, Supplemental Digital Content 1, http://links.lww.com/SLA/D998).

Use of Telemedicine

The proportion of patients with follow-up using telemedicine ranged from 45% to 96%. Study sizes ranged from 141 to 11225 patients. The pooled proportion of patients with telemedicine follow up on meta-analysis was 64% (95% CI: 55%–73%). There was very high heterogeneity ($I^2 = 100\%$, $P < 0.001$).

Delivery of Telemedicine

Four included studies did not state a standardized schedule for outcome assessment. 22.2% (2/9) used the Public Health England Postdischarge Surveillance Questionnaire[25,29] and 33.3% (3/9) used questions based on CDC criteria.[27,28,33] 77.8% (7/9) were used as a one-off assessment at 30 postoperative days,[25–27,30–33] with 2 using serial postoperative assessments.[28,29]

Comparison of Telemedicine to In-person Follow-up

Four studies involved a comparator of telemedicine to in-person follow-up method[25–28] and were included in meta-analysis of SSI rates reported, combined with the cohort study data (5 studies in total). Two studies had paired within-subject measurements at the same time point,[25,28] and 2 had measurements at the same time point but in different patient groups.[26,27] Only 2 (50%) compared telemedicine to an in-person assessment according to US Centre for Disease Control criteria (Table 3). In the random effects meta-analysis, the rate of SSI reported using telemedicine was significantly lower in the telemedicine group than the in-person group (0.67, 95% CI: 0.47–0.94). There was some evidence of between-study heterogeneity, but this did not have a significant effect on the random effects meta-analysis ($I^2 = 0.45$, 0.00–0.78, $P = 0.12$; $\tau = 0.27$, 0.00–0.93; Fig. 5). There was no significant evidence of funnel plot asymmetry (Supplementary Fig. 5, Supplemental Digital Content 1, http://links.lww.com/SLA/D998, $P = 0.326$).

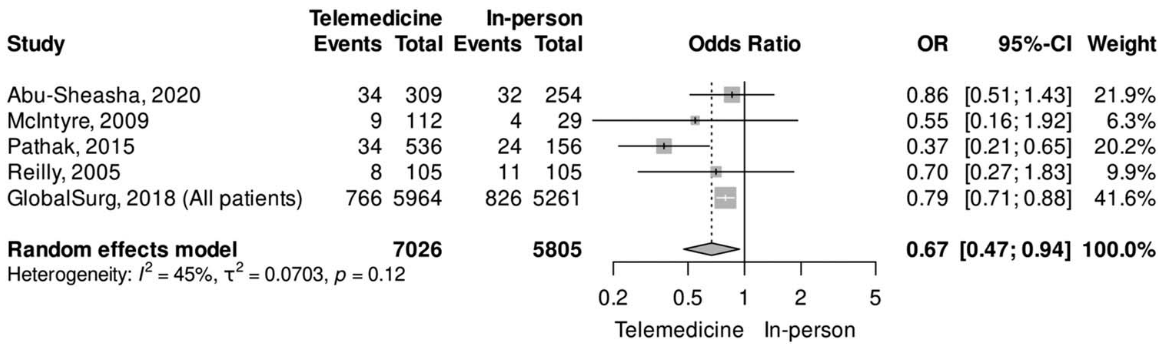

FIGURE 5. Forest plot of rates of SSI reported by telemedicine and in-person follow-up on meta-analysis. Odds ratios displayed describes a comparison of the odds of patients having an SSI reported with telemedicine versus in-person follow-up (ie, a reduced odds ratio conveys a lower rate of SSI reported with one method in comparison to the other, and vice versa).

Comparison of Telemedicine to Other Follow-up Methods

Five studies compared telemedicine to a follow-up method that did not require in-person review (eg, Electronic Health Records or postal questionnaire).[29–33] These are summarized in Table 3 but excluded in the meta-analysis of SSI rates. Four of 5 studies had a higher rate of reporting of SSI in the telemedicine group than the electronic health records or postal questionnaire group. One study had a much lower SSI rate reported by telemedicine than electronic health records (1.1% vs 11.2%), but the 2 methods were applied in clearly different patient populations (responders to a postal questionnaire vs nonresponders).[29]

DISCUSSION

This cohort study and meta-analysis identified that use of telemedicine for wound assessment postdischarge is feasible across settings. The adjusted rate of SSI reported using telemedicine in patients that underwent postdischarge assessment was lower than with in-person follow-up in the international cohort study, raising concerns of underreporting of SSI. This was robust to several sensitivity analyses, a propensity score-matched model and across HDI settings. This analysis of real-world, global data suggests that telemedicine methods used in the pre-pandemic setting may risk patient safety or introduce bias to research studies. This was corroborated in the combined meta-analysis. The studies included were of low quality, and rarely used standardized tools. High-quality frameworks for remote assessment of SSI must be evaluated and adopted as telemedicine is upscaled globally.

Telemedicine for follow-up of surgical patients holds significant promise during the SARS-CoV-2 pandemic recovery effort. The high connectivity of global telecommunication networks opens opportunities for telemedicine in both well-resourced and resource constrained settings.[34] Efficient methods for surgical follow-up may be most relevant in LMICs where patients may already travel long distances or take time out of work to return to hospital after discharge, and health systems face severe resource limitations.[35–39] During future SARS-CoV-2 outbreaks, use of telemedicine may reduce the risk of exposure in hospital outpatient settings.[2] During the postpandemic recovery, it may help alleviate the growing backlog of outpatient appointments and investigations that health systems face around the world.[40–42] However, as the use of these methods increases, it is important that the quality of assessment does not decrease. Delayed or missed identification of postoperative complications can lead to failure to rescue and death, more severe sequalae, and increased costs[21,43;] these events, while rare, have the potential to undermine the benefits of telemedicine, particularly for higher-risk patients and operations.[44]

Two different standaridzed tools for identification of SSI using telemedicine (Centre for Disease Control Criteria and Public Health England Postdischarge Questionnaire) were identified in the systematic review, but neither have been formally adapted or validate for use in telemedicine. A universal outcome reporter "Bluebelle" Wound Healing Questionnaire has demonstrated promise as tool for remote detection of SSI, demonstrating excellent discrimination and reliability[45,46;] however, this has only undergone evaluation in a single language in one country, and cultural and linguistic adaptation and validation to support international application.[47] No included studies used videography to help identify SSI; this may prove a useful adjunct to future development in this area.

SSI has been identified as a key priority to improve the health of patients undergoing surgery worldwide, particularly in low resource settings.[48,49] Lessons from use of telemedicine for wound assessment may be generalizable to other common complications of surgery, but bespoke tools may be required for each to ensure accurate identification of different events. Quality-assured digital methods for remote assessment will also have high value for use in pragmatic international trials, where delivery can be made more efficient, and more benefit for more patients can be realized at a lower time and resource cost.[50,51]

This study has several limitations. First, we infer that the "gold standard" in-person assessment represents the true SSI rate. We are unable to assert from our data whether SSI is over-reported using in-person follow-up or under-reported using telemedicine where a difference is observed. Second, we assume that the differences in reported SSI rates are unrelated to differences in patient characteristics after risk-adjustment. While we used multilevel models to adjust for several confounders, there is a risk of residual selection bias. Third, the quality of studies included in meta-analysis was low. We excluded studies that reported SSI when telemedicine was used for a clearly different patient populations (eg, different subgroups of patients, responders vs nonresponders, different geographical areas), with no comparator group, or a comparator group at a different time point (eg, in-hospital vs 30-day remote assessment). However, remaining studies demonstrated some "selection" of patients for telemedicine follow-up, no studies were randomized, and all were at moderate or severe risk of bias. Fourth, we do not have paired within-patient measures of SSI in-hospital and post-discharge at 30 days, and we are therefore unable to fully account for changes in patient selection to a particular follow-up modality as a result of inpatient infection. This may have exaggerated the difference between telephone and in-person follow-up; however, our analysis of postoperative mortality did not indicate a serious risk of reverse causation. Fifth, as the patients with "inpatient only" follow-up had no postdischarge wound assessment they were effectively "lost to follow-up" for the purposes of the primary 30-day analysis. As we do not know the intended follow-up method (ie, whether telemedicine or in-person follow-up was planned, but only inpatient data were collected) we are unable to fully explore the impact of attrition bias on the primary comparison. Sixth, there is a further risk of reverse causation in linking patients with inpatient only assessment and a lower observed SSI rate (ie, those without features of SSI postoperatively may be less likely to reinteract with clinical services). As such, this group were excluded from multivariable analyses, and we recommend caution in interpretation. Seventh, we were unable to differentiate here between different methods of remote wound assessment (ie, telephone vs video), although from ongoing work across our network it is likely that a majority of assessment would have been telephone-based.[47] Eight, the cohort study used a pragmatic observation methodology and did not standardize training or delivery of telemedicine. This should therefore be interpreted as the real-world effectiveness of telemedicine, rather than the potential efficacy of telemedicine in an optimized system.[52] Finally, we have only included one, common postoperative complication in our synthesis. These data set the scene for a broad research agenda to identify and validate tools for remote digital assessment across diverse patient groups and operation types. The rapid upscaling of telemedicine during the SARS-CoV-2 pandemic highlights this as an urgent research priority for the global surgical community.

ACKNOWLEDGMENTS

The authors thank the organizations assisting in dissemination and/or translation (alphabetical): Asian Medical Students' Association (AMSA), Association of Surgeons in Training (ASiT), College of Surgeons of East, Central & Southern Africa (COSECSA), Cutting Edge Manipal, Egyptian Medical Student Research Association (EMRA), International Collaboration For Essential Surgery (ICES), International Federation of Medical Student Associations (IFMSA), Italian Society of Colorectal Surgery (SICCR), Lifebox Foundation, School of Surgery, Student Audit and Research in Surgery (STARSurg), The Electives Network, United Kingdom National Research Collaborative, World Society of Emergency Surgery (WSES), World Surgical Association (WSA).

REFERENCES

1. COVIDSurg-Collaborative. Surgery during the COVID-19 pandemic—authors' reply. *Lancet*. 2020;396:E79.
2. COVIDSurg Collaborative. Glasbey JC, Nepogodiev D, Simoes JFF. Elective Cancer Surgery in COVID-19-Free Surgical Pathways During the SARS-CoV-2 Pandemic: An International, Multicenter, Comparative Cohort Study. *J Clin Oncol*. 2021;39:66–78.
3. Simoes J, Bhangu A. Should we be re-starting elective surgery? *Anaesthesia*. 2020;75:1563–1565.
4. COVIDSurg Collaborative. Global guidance for surgical care during the COVID-19 pandemic. *Br J Surg*. 2020;107:1097–1103.
5. Chao GF, Li KY, Zhu Z, et al. Use of telehealth by surgical specialties during the COVID-19 pandemic. *JAMA Surg*. 2021;156:620–626.
6. Grenda TR, Whang S, Evans NR III. Transitioning a surgery practice to telehealth during COVID-19. *Ann Surg*. 2020;272:e168–e169.
7. Hakim AA, Kellish AS, Atabek U, et al. Implications for the use of telehealth in surgical patients during the COVID-19 pandemic. *Am J Surg*. 2020;220:48–49.
8. Carr A, Smith JA, Camaradou J, et al. Growing backlog of planned surgery due to covid-19. *Bmj*. 2021;372:n339.
9. Barie PS, Ho VP, Hunter CJ, et al. Surgical Infection Society Guidance for Restoration of Surgical Services during the coronavirus disease-2019 pandemic. *Surg Infect (Larchmt)*. 2021;22:818–827.
10. Shrime M, Dare AJ, Alkire BC, et al. Catastrophic expenditure to pay for surgery worldwide: a modelling study. *Lancet Glob Health*. 2015;3 Suppl 2 (0 2):S38–44.
11. Andersson AE, Bergh I, Karlsson J, et al. Patients' experiences of acquiring a deep surgical site infection: an interview study. *Am J Infect Control*. 2010;38:711–717.
12. Gheorghe A, Moran G, Duffy H, et al. Health utility values associated with surgical site infection: a systematic review. *Value Health*. 2015;18:1126–1137.
13. Badia JM, Casey AL, Petrosillo N, et al. Impact of surgical site infection on healthcare costs and patient outcomes: a systematic review in six European countries. *J Hosp Infect*. 2017;96:1–15.
14. Horan TC, Andrus M, Dudeck MA. CDC/NHSN surveillance definition of health care-associated infection and criteria for specific types of infections in the acute care setting. *Am J Infect Control*. 2008;36: 309–332.
15. GlobalSurg-Collaborative. Surgical site infection after gastrointestinal surgery in high-income, middle-income, and low-income countries: a prospective, international, multicentre cohort study. *Lancet Infect Dis*. 2018;18:516–525.
16. Welsh Barbers SSI Research Collaborative, Reeves N, Cuff S, Boyce K, et al. Diagnosis of colorectal and emergency surgical site infections in the era of enhanced recovery: an all-Wales prospective study. *Colorectal Dis*. 2021;23:1239–1247.
17. Healthcare Infection Control Practices Advisory Committee, Berríos-Torres SI, Umscheid CA, Bratzler DW, et al. Centers for disease control and prevention guideline for the prevention of surgical site infection. *JAMA Surg*. 2017;152:784–791.
18. Matthews JH, Bhanderi S, Chapman SJ, et al. Underreporting of secondary endpoints in randomized trials: cross-sectional, observational study. *Ann Surg*. 2016;264:982–986.
19. West Midlands Research Collaborative; ROSSINI Trial Investigators, Pinkney TD, Calvert M, Bartlett DC, et al. Impact of wound edge protection devices on surgical site infection after laparotomy: multicentre randomised controlled trial (ROSSINI Trial). *Bmj*. 2013;347:f4305.
20. International Surgical Outcomes Study (ISOS) group, Ahmad T, Bouwman RA, Grigoras I, et al. Use of failure-to-rescue to identify international variation in postoperative care in low-, middle- and high-income countries: a 7-day cohort study of elective surgery. *Br J Anaesth*. 2017;119:258–266.
21. GlobalSurg Collaborative and National Institute for Health Research Global Health Research Unit on Global Surgery. Global variation in postoperative mortality and complications after cancer surgery: a multicentre, prospective cohort study in 82 countries. *Lancet*. 2021;397:387–397.
22. GlobalSurg Collaborative. Determining the worldwide epidemiology of surgical site infections after gastrointestinal resection surgery: protocol for a multicentre, international, prospective cohort study (GlobalSurg 2). *BMJ Open*. 2017;7:e012150.
23. Ho D, et al. Matching as nonparametric preprocessing for reducing model dependence in parametric causal inference. *Political Analysis*. 2007;15:199–236.
24. Rubin DB. The design versus the analysis of observational studies for causal effects: parallels with the design of randomized trials. *Stat Med*. 2007;26:20–36.
25. Abu-Sheasha GA, Bedwani RN, Anwar MM, et al. Cost-effectiveness analysis of three methods of surgical-site infection surveillance: less is more. *Am J Infect Control*. 2020;48:1220–1224.
26. Pathak A, Sharma S, Sharma M, et al. Feasibility of a mobile phone-based surveillance for surgical site infections in rural India. *Telemed J E Health*. 2015;21:946–949.
27. McIntyre LK, Warner KJ, Nester TA, et al. The incidence of post-discharge surgical site infection in the injured patient. *J Trauma*. 2009;66:407–410.
28. Reilly J, Noone A, Clift A, et al. A study of telephone screening and direct observation of surgical wound infections after discharge from hospital. *J Bone Joint Surg Br*. 2005;87:997–999.

29. Bediako-Bowan A, Owusu E, Debrah S, et al. Surveillance of surgical site infection in a teaching hospital in Ghana: a prospective cohort study. *J Hosp Infect*. 2020;104:321–327.
30. Burlingame J, et al. Assessment of cesarean delivery surgical site infection: a comparison of methods. *American Journal of Obstetrics & Gynecology* Volume 212, Issue 1, S175 - S176.
31. Golub AV, Kozlov RS, Pleshkov VG, et al. Surgical site infections after open appendectomy and effectiveness of complex approach to their prevention. Khirurgiia (Mosk). 2016:68–76.
32. Pham JC, et al. Surgical site infection: Comparing surgeon versus patient self-report.
33. Petrosillo N, Ashton MJ, Kimata C, et al. Surgical site infections in Italian hospitals: a prospective multicenter study. *BMC Infect Dis*. 2008;8:34.
34. Arie S. Can mobile phones transform healthcare in low and middle income countries? *Bmj*. 2015;350:h1975.
35. Shrime MG, Dare AJ, Alkire BC, et al. Catastrophic expenditure to pay for surgery worldwide: a modelling study. *Lancet Glob Health*. 2015;3 (suppl 2):S38–S44.
36. Raykar NP, Bowder AN, Liu C, et al. Geospatial mapping to estimate timely access to surgical care in nine low-income and middle-income countries. *Lancet*. 2015;385(suppl 2):S16.
37. Alkire BC, Raykar NP, Shrime MG, et al. Global access to surgical care: a modelling study. *Lancet Glob Health*. 2015;3:e316–e323.
38. Raykar NP, Yorlets RR, Liu C, et al. A qualitative study exploring contextual challenges to surgical care provision in 21 LMICs. *Lancet*. 2015;385(suppl 2):S15.
39. Meara JG, Hagander L, Leather AJM. Surgery and global health: a Lancet Commission. *Lancet*. 2014;383:12–13.
40. COVIDSurg Collaborative, Shaw R. UK Head and neck cancer surgical capacity during the second wave of the COVID-19 pandemic: Have we learned the lessons? COVIDSurg collaborative. *Clin Otolaryngol*. 2021;46:729–735.
41. Hanna TP, King WD, Thibodeau S, et al. Mortality due to cancer treatment delay: systematic review and meta-analysis. *BMJ*. 2020;371: m4087.
42. Sud A, Jones ME, Broggio J, et al. Collateral damage: the impact on outcomes from cancer surgery of the COVID-19 pandemic. *Ann Oncol*. 2020;31:1065–1074.
43. Ghaferi AA, Birkmeyer JD, Dimick JB. Variation in hospital mortality associated with inpatient surgery. *N Engl J Med*. 2009;361:1368–1375.
44. Harkey K, Kaiser N, Zhao J, et al. Postdischarge virtual visits for low-risk surgeries: a randomized noninferiority clinical trial. *JAMA Surg*. 2021;156:221–228.
45. Macefield RC, et al. Development of a single, practical measure of surgical site infection (SSI) for patient report or observer completion. *J Infect Prev*. 2017;18:170–179.
46. Bluebelle Study Group, Reeves BC, Reeves BC, Milne TK, et al. A mixed-methods feasibility and external pilot study to inform a large pragmatic randomised controlled trial of the effects of surgical wound dressing strategies on surgical site infections (Bluebelle Phase B): study protocol for a randomised controlled trial. *Trials*. 2017;18:401.
47. NIHR-Global-Health-Research-Unit-on-Global-Surgery. Feasibility and diagnostic accuracy of Telephone Administration of an adapted patient-reported wound heaLing QuestiONnaire for assessment of surgical site infection following abdominal surgery in low and middle-income countries (TALON): Protocol for a validation study within a trial (SWAT). *Trials*. 2021;22:471.
48. National Institute for Health Research Global Health Research Unit on Global Surgery. Prioritizing research for patients requiring surgery in low- and middle-income countries. *Br J Surg*. 2019;106:e113–e120.
49. National Institute for Health Research Global Research Health Unit on Global Surgery. Delphi prioritization and development of global surgery guidelines for the prevention of surgical-site infection. *Br J Surg*. 2020;107:970–977.
50. Karzai F, Madan RA, Dahut WL. The world of clinical trial development post COVID-19: lessons learned from a global pandemic. *Clin Cancer Res*. 2020;26:4198–4200.
51. Lorusso D, Ray-Coquard I, Oaknin A, et al. Clinical research disruption in the post-COVID-19 era: will the pandemic lead to change? *ESMO Open*. 2020;5:e000924.
52. Loudon K, Treweek S, Sullivan F, et al. The PRECIS-2 tool: designing trials that are fit for purpose *BMJ*. 2015;350:h2147.

APPENDIX

Authorship list (PubMed citable): *Writing group*: James Glasbey (UK), Issi Trout (UK), Victoria Adeyeye (Nigeria), Adesoji Ademuyiwa (Nigeria), Adewale Adisa (Nigeria), Alisha Bhatt (India), Bruce Biccard (South Africa), Peter Brocklehurst (UK), Sohini Chakrabortee (UK), Jean De La Croix Allen Ingabire (Rwanda), Francis Moïse Dossou (Benin), Irani Durán (Mexico), Rohini Dutta (India), Dhruva Ghosh (India), Frank Gyamfi (Ghana), Pollyanna Hardy (UK), Gabriella Hyman (South Africa), Ritu Jain (India), Bryar Kadir (UK), Stephen Knight (UK), Oluwaseun Ladipo-Ajayi (Nigeria), Ismail Lawani (Benin), Souliath Lawani (Benin), Rachel Lillywhite (UK), Rhiannon Macefield (UK), Laura Magill (UK), Janet Martin (Canada), Jonathan Mathers (UK), Kenneth McLean (UK), Punam Mistry (UK), Rohin Mittal (India), Rachel Moore (South Africa), Dion Morton (UK), Faustin Ntirenganya (Rwanda), Emmanuel Ofori (Ghana), Rupert Pearse (UK), Alberto Peón (Mexico), Thomas Pinkney (UK), Antonio Ramos de la Medina (Mexico), Tubasiime Ronald (Rwanda), David Roman (Mexico), Joana Simoes (UK), Anita Slade (UK), Stephen Tabiri (Ghana), Donna Smith (UK), Ewen Harrison (UK), Aneel Bhangu (UK).

Statistical analysis and data handling: James Glasbey, Issi Trout, Aneel Bhangu.

GlobalSurg-2 Patient representatives: Azmina Verjee (UK), Emmy Runigamugabo (Rwanda).

GlobalSurg-2 Protocol development and project steering: Adesoji O Ademuyiwa, Adewale O Adisa, Maria Lorena Aguilera, Afnan Altamini, Philip Alexander, Sara W Al-Saqqa, Giuliano Borda-Luque, Jen Cornick, Ainhoa Costas-Chavarri, Thomas M Drake, Stuart J Fergusson, J Edward Fitzgerald, James Glasbey, J. C Allen Ingabire, Lawani Ismaïl, Zahra Jaffry, Hosni Khairy Salem, Chetan Khatri, Andrew Kirby, Anyomih Theophilus Teddy Kojo, Marie Carmela Lapitan, Richard Lilford, Andre L Mihaljevic, Midhun Mohan, Dion Morton, Alphonse Zeta Mutabazi, Dmitri Nepogodiev, Faustin Ntirenganya, Riinu Ots, Francesco Pata, Thomas Pinkney, Tomas Poškus, Ahmad Uzair Qureshi, Antonio Ramos-De la Medina, Sarah Rayne, Gustavo Recinos, Kjetil Søreide, Catherine A Shaw, Sebastian Shu, Richard Spence, Neil Smart, Stephen Tabiri, Richard Lilford, Dion Morton, Ewen M Harrison, Aneel Bhangu.

GlobalSurg-2 National leads: Argentina, Maria Marta Modolo; **Australia**, Dushyant Iyer, Sebastian King, Tom Arthur; **Bangladesh**, Sayeda Nazmum Nahar; **Barbados,** Ade Waterman; **Benin**, Lawani Ismaïl; **Botswana,** Michael Walsh; **Canada,** Arnav Agarwal, Augusto Zani, Mohammed Firdouse, Tyler Rouse; **China,** Qinyang Liu; **Colombia,** Juan Camilo Correa; **Egypt,** Hosni Khairy Salem; **Estonia,** Peep Talving; **Ethiopia,** Mengistu Worku; **France**, Alexis Arnaud; **Ghana,** Stephen Tabiri; **Greece,** Vassilis Kalles; **Guatemala**, Maria Lorena Aguilera, Gustavo Recinos; **India**, Basant Kumar, Sunil Kumar; **Indonesia**, Radhian Amandito; **Ireland**, Roy Quek; **Italy**, Francesco Pata, Luca Ansaloni; **Jordan**, Ahmed Altibi; **Lithuania**, Donatas Venskutonis, Justas Zilinskas, Tomas Poskus; **Madagascar**, John Whitaker; **Malawi**, Vanessa Msosa; **Malaysia**, Yong Yong Tew; **Malta**, Alexia Farrugia, Elaine Borg; **Mexico**, Antonio Ramos-De la Medina; **Morocco**, Zineb Bentounsi; **Nigeria**, Adesoji O Ademuyiwa; **Norway**, Kjetil Søreide; **Pakistan,** Tanzeela Gala; **Palestinian Territory,** Ibrahim Al-Slaibi, Haya Tahboub, Osaid H. Alser; **Peru,** Diego Romani, Sebestian Shu; **Poland,** Piotr Major; **Romania**, Aurel Mironescu, Matei Bratu, Amar Kourdouli; **Saint Kitts and Nevis,** Aliyu Ndajiwo; **Saudi Arabia,** Abdulaziz Altwijri, Mohammed Ubaid Alsaggaf, Ahmad Gudal, Al Faifi Jubran; **Sierra Leone,** Sam Seisay; **Singapore,** Bettina Lieske; **South Africa,** Sarah Rayne, Richard Spence; **Spain,** Irene Ortega; **Sri Lanka,** Jenifa Jeyakumar, Kithsiri J. Senanayake; **Sudan,** Omar Abdulbagi; **Sweden,** Yucel Cengiz; **Switzerland,** Dmitri Raptis; **Turkey,** Yuksel Altinel; **United Kingdom,** Chia Kong, Ella Teasdale, Gareth Irwin, Michael Stoddart, Rakan Kabariti, Sukrit Suresh; **United States,** Katherine Gash, Ragavan Narayanan; **Zambia,** Mayaba Maimbo.

GlobalSurg-2 Local collaborators: **Albania:** Besmir Grizhja, Shpetim Ymeri, Gezim Galiqi (Spitali Rajonal Shkoder); **Argentina:** Roberto Klappenbach, Diego Antezana, Alvaro Enrique Mendoza Beleño, Cecilia Costa, Belen Sanchez, Susan Aviles (Hospital Zonal General De Agudos Simplemente Evita); Maria Marta Modolo, Claudio Gabriel Fermani, Rubén Balmaceda, Santiago Villalobos, Juan Manuel Carmona (Hospital Luis C. Lagomaggiore, Mendoza); **Australia**: Daniel Hamill, Peter Deutschmann, Simone Sandler, Daniel Cox (Alice Springs Hospital); Ram Nataraja, Claire Sharpin, Damir Ljuhar (Monash Medical Center); Demi Gray, Morgan Haines (Port Macquarie Base Hospital); Dush Iyer, Nithya Niranjan, Scott D'Amours (Liverpool Hospital); Morvarid Ashtari, Helena Franco, (Gold Coast University Hospital); **Bangladesh**: Ashrarur Rahman Mitul, Sabbir Karim, (Dhaka Shishu (Children) Hospital); Nowrin F. Aman, Mahnuma Mahfuz Estee (Holy Family Red Crescent Medical College & Hospital); Umme Salma, Joyeta Razzaque, Tasnia Hamid Kanta (Dhaka Medical College And Hospital); Sayeeda Aktar Tori, Shadid Alamin, Swapnil Roy, Shadid Al Amin, Rezaul Karim (Armed Forces Medical College); Muhtarima Haque, Amreen Faruq, Farhana Iftekhar (Birdem Bangladesh Institute Of Research And Rehabilitation In Diabetes Endocrine And Metabolic Disorder General Hospital); **Barbados**: Margaret O'Shea, Greg Padmore, Ramesh Jonnalagadda (Queen Elizabeth Hospital); **Belarus**: Andrey Litvin, Aliaksandr Filatau, Dzmitry Paulouski, Maryna Shubianok, Tatsiana Shachykava (Gomel Regional Clinical Hospital); Dzianis Khokha, Vladimir Khokha (City Hospital); **Benin**: Fernande Djivoh, Lawani Ismaïl, Francis Dossou (Centre National Hospitalier Et Universitaire Hubert Koutoukou Maga); Djifid Morel Seto, Dansou Gaspard Gbessi, Bruno Noukpozounkou, Yacoubou Imorou Souaibou, (Centre National Hospitalier Et Universitaire Hubert Koutoukou Maga); Kpèmahouton René Keke, Fred Hodonou (Clinique Vignon); Ernest Yemalin Stephane Ahounou, Thierry Alihonou (Hopital El Fateh); Max Dénakpo, Germain Ahlonsou (Hospital Saint Luc); **Botswana**: Alemayehu Ginbo Bedada (Princess Marina Hospital); **Burundi**: Carlos Nsengiyumva, Sandrine Kwizera, Venerand Barendegere (Hopital Militaire De Kamenge); **Cambodia**: Philip Choi, Simon Stock (World Mate Emergency Hospital); **Canada**: Luai Jamal, Mohammed Firdouse, Augusto Zani, Georges Azzie, Sameer Kushwaha, Arnav Agarwal (The Hospital For Sick Children); **China**: Tzu-Ling Chen, Chingwan Yip (Fudan University Affiliated Huashan Hospital); **Colombia**: Irene Montes, Felipe Zapata, Sebastian Sierra (Clinica CES); Maria Isabel Villegas Lanau, Maria Clara Mendoza Arango, Ivan Mendoza Restrepo (Clinica Las Vegas), Sebastian Sierra, Ruben Santiago Restrepo Giraldo, Maria Clara Mendoza Arango (Hospital Universitario San Vicente Fundación); **Croatia**: Edgar Domini, Robert Karlo, Jakov Mihanovic (Zadar General Hospital); **Egypt**: Mohamed Youssef, Hossam Elfeki, Waleed Thabet, Aly Sanad, Gehad Tawfik, Ahmed Zaki, Noran Abdel-Hameed, Mohamed Mostafa, Muhammad Fathi Waleed Omar, Ahmed Ghanem, Emad Abdallah, Adel Denewar, Eman Emara, Eman Rashad, Ahmad Sakr, Rehab Elashry, Sameh Emile (Mansoura University Hospital); Toqa Khafagy, Sara Elhamouly, Arwa Elfarargy, Amna Mamdouh Mohamed, Ghada Saied Nagy, Abeer Esam, Eman Elwy, Aya Hammad, Salwa Khallaf, Eman Ibrahim, Ahmed Saidbadr, Ahmed Moustafa, Amany Eldosouky Mohammed, Mohammed Elgheriany, Eman Abdelmageed, Eman Abd Al Raouf, Esraa Samir Elbanby, Maha Elmasry, Mahitab Morsy Farahat, Eman Yahya Mansor, Eman Magdy Hegazy, Esraa Gamal, Heba Gamal, Hend Kandil, Doaa Maher Abdelrouf, Mohamed Moaty,(Menofiya University Hospital); Dina Gamal, Nada El-Sagheer, Mohamed Salah, Salma Magdy, Asmaa Salah, Ahmed Essam, Ahmed Ali, Mahmoud Badawy, Sara Ahmed, (Beni Suef University Hospital); Mazed Mohamed, Abdelrahman Assal, Mohamed Sleem, Mai Ebidy, Aly Abd Elrazek, Diaaaldin Zahran, Nourhan Adam, Mohamed Nazir, Adel B Hassanein, Ahmed Ismail, Amira Elsawy, Rana Mamdouh, Mohamed Mabrouk, Lopna Ahmed Mohamed Ahmed, Mohamed Hassab Alnaby, Eman Magdy, Manar Abd-Elmawla, Marwan Fahim, Bassant Mowafy, Moustafa Ibrahim Mahmoud, Meran Allam, Muhammad Alkelani, Noran Halim El Gendy, Mariam Saad Aboul-Naga, Reham Alaa El-Din, Alyaa Halim Elgendy, Mohamed Ismail, Mahmoud Shalaby, Aya Adel Elsharkawy, Mahmoud Elsayed Moghazy, Khaled Hesham Elbisomy, Hend Adel Gawad Shakshouk, Mohamed Fouad Hamed, Mai Mohamed Ebidy, Mostafa Abdelkader, Mohamed Karkeet (Alexandria Main UniversIty Hospital); Hayam Ahmed, Israa Adel, Mohammad Elsayed Omar, Mohamed Ibrahim, Omar Ghoneim, Omar Hesham, Shimaa Gamal, Karim Hilal, Omar Arafa, Sawsan Adel Awad, Menatalla Salem, Fawzia Abdellatif Elsherif, Nourhan Elsabbagh, Moustafa R. Aboelsoud, Ahmed Hossam Eldin Fouad Rida, Amr Hossameldin, Ethar Hany, Yomna Hosny Asar, Nourhan Anwar, Mohamed Gadelkarim, Samar Abdelhady, Eman Mohamed Morshedy, Reham Saad, Nourhan Soliman, Mahmoud Salama (Alexandria Medical Research Institute); Eslam Ezzat, Arwa Mohamed, Arwa Ibrahim, Alaa Fergany, Sara Mohammed, Aya Reda, Yomna Allam, Hanan Adel Saad, Afnan Abdelfatah, Aya Mohamed Fathy, Ahmed El-Sehily, Esraa Abdalmageed Kasem, Ahmed Tarek Abdelbaset Hassan, Ahmed Rabeih Mohammed, Abdalla Gamal Saad, Yasmin Elfouly, Nesma Elfouly, Arij Ibrahim, Amr Hassaan, Mohammed Mustafa Mohammed, Ghada Elhoseny, Mohamed Magdy, Esraa Abd Elkhalek, Yehia Zakaria, Tarek Ezzat, Ali Abo El Dahab, Mohamed Kelany, Sara Arafa, Osama Mokhtar Mohamed Hassan, Nermin Mohamed Badwi, Ahmad Saber Sleem, Hussien Ahmed, Kholoud Abdelbadeai, Mohamed Abozed Abdullah (Faculty Of Medicine, Zagazig University); Muhammad Amsyar Auni Lokman, Suraya Bahar, Anan Rady Abdelazeam, Abdelrahman Adelshone, Muhammad Bin Hasnan, Athirah Zulkifli, Siti Nur Alia Kamarulzamil, Abdelaziz Elhendawy, Aliang Latif, Ahmad Bin Adnan, Shahadatul Shaharuddin, Aminah Hanum Haji Abdul Majid, Mahmoud Amreia, Dina Al-Marakby, Mahmoud Salma, Mohamad Jeffrey Bin Ismail, Elissa Rifhan Mohd Basir, Citra Dewi Mohd Ali, Aya Yehia Ata (Faculty Of Medicine, Tanta University); Maha Nasr, Asmaa Rezq, Ahmed Sheta, Sherif Tariq, Abd Elkhalek Sallam, Abdelrhman KZ Darwish, Sohaila Elmihy, Shady Elhadry, Ahmed Farag, Haidar Hajeh, Abdelaziz Abdelaal, Amro Aglan, Ahmed Zohair, Mahitab Essam, Omar Moussa, Esraa El-Gizawy, Mostafa Samy, Safia Ali, Esraa Elhalawany, Ahmed Ata, Mohamed El Halawany, Mohamed Nashat, Samar Soliman, Alaa Elazab, Mostada Samy, (El-Menshawy General Hospital); Mohamed A Abdelaziz, Khaled Ibrahim, Ahmed mohamed Ibrahim, Ammar Gado, Usama Hantour (Al-Hussein Hospital); Esraa Alm Eldeen, Mohamed Reda loaloa, Arwa Abouzaid, Mostafa Ahmed Bahaa Eldin, Eman Hashad, Fathy Sroor, Doaa Gamil, Eman Mahmoud Abdulhakeem, Mahmoud Zakaria, Fawzy Mohamed, Marwan Abubakr, Elsayed Ali, Hesham Magdy, Menna Tallah Ramadan, Mohamed Abdelaty Mohamed, Salma Mansour, Hager Abdul Aziz Amin, Ahmed Rabie Mohamed, Mahmoud Saami, Nada Ahmed Reda Elsayed, Adham Tarek, Sabry Mohy Eldeen Mahmoud, Islam Magdy El Sayed, Amira Reda, Martina Yusuf Shawky, Mohammed Mousa Salem, Shahinaz Alaa El-Din, Noha Abdullah Soliman, Muhammed Talaat, Shahinaz Alaael-Dein, Ahmed Abd Elmoen Elhusseiny, Noha Abdullah, Mohammed Elshaar, Aya AbdelFatah Ibraheem, Hager Abdulaziz, Mohammed Kamal Ismail, Mona Hamdy Madkor, Mohamed Abdelaty, Sara Mahmoud Abdel-Kader, Osama Mohamed Salah, (Benha Faculty Of Medicine); Mahmoud Eldafrawy, Ahmed Zaki Eldeeb, Mostafa Mahmoud Eid (October 6 University Hospital); Attia Attia, Khalid Salah El-Dien, Ayman Shwky (Bab El-Shareia University Hospital); Mohamed Adel Badenjki, Abdelrahman Soliman, Samaa Mahmoud Al Attar, (The Memorial Soaad Kafafi University Hospital); Farrag Sayed, Fahd Abdel Sabour, Mohammed G. Azizeldine, Muhammad Shawqi, Abdullah Hashim, Ahmed Aamer, Ahmed Mahmoud Abdelraouf, Mahmoud Abdelshakour, Amal Ibrahim, Basma Mahmoud, Mohamed Ali Mahmoud, Mostafa Qenawy, Ahmed M. Rashed, Ahmed Dahy, Marwa Sayed, Ahmed W. Shamsedine, Bakeer Mohamed, Ahmad Hasan, Mahmoud M. Saad, Khalil Abdul Bassit (Assiut University Hospital); Nadia Khalid Abd El-Latif, Nada Elzahed, Ahmed El Kashash, Nada Mohamed Bekhet, Sarah Hafez, Ahmed Gad, Mahmoud Elkhadragy Maher, Ahmed Abd Elsameea, Mohamed Hafez, Ahmad Sabe, Ataa Ahmed, Ahmed Shahine, Khaled Dawood, Shireen Gaafar, Reem Husseiny, Omnia Aboelmagd, Ahmed Soliman, Nourhan Mesbah, Hossam Emadeldin, Amgad Al Meligy, Amira Hassan Bekhet, Doaa Hasan, Khaled Alhady, Ahmad Khaled Sabe, Mahmoud A. Elnajjar, Majed Aboelella, Ward Hamsho, Ihab Hassan, Hala Saad, Galaleldin Abdelazim, Hend Mahmoud, Noha Wael, Ahmedali M Kandil, Ahmed Magdy, Shimaa Said Elkholy, Badr Eldin Adel, Kareem Dabbour, Saged Elsherbiney, Omar Mattar, Abdulshafi Khaled Abdrabou, Mohammed Yahia Mohamed Aly, Abdelrahman Geuoshy, Ahmedglal Elnagar, Saraibrahim Ahmed, Ibrahem Abdelmotaleb, Amr Ahmed Saleh, Manar Saeed, Shady Mahmoud, Badreldin Adel Tawfik, Samar Adel Ismail, Esraay Zakaria, Mariam O. Gad, Mohamed Salah Elhelbawy, Monica Bassem, Noha Maraie, Nourhan Medhat Elhadary, Nourhan Semeda, Shaza Rabie Mohamed, Hesham Mohammed Bakry, AA Essam (Kasr Al-Ainy Faculty Of Medicine, Cairo University); Dina Tarek, Khlood Ashour, Alaa Elhadad, Abdulrahman Abdel-Aty, Ibrahim Rakha, Sara Mamdouh Matter, Rasha Abdelhamed, Omar Abdelkader, Ayat Hassaan, Yasmin Soliman, Amna Mohamed, Sara Ghanem, Sara Amr Mohamed Farouk, Eman Mohamed Ibrahim, Esraa El-Taher (Faculty Of Medicine Seuz Canal University); Merna Mostafa, Mohamed Fawzy Mahrous Badr, Rofida Elsemelawy, Aya El-Sawy, Ahmad Bakr, Ahmad Abdel Razaq Al Rafati (Smouha University Hospital); **Estonia**: Sten Saar, Arvo Reinsoo, Peep Talving (The North Estonia Medical Centre); **Ethiopia**: Nebyou Seyoum, Tewodros Worku, Agazi Fitsum, (Addis Ababa University, College Of Health Sciences, School Of Medicine); **Finland:** Matti Tolonen, Ari Leppäniemi, Ville Sallinen (Helsinki University Hospital); **France**: Benoît Parmentier, Matthieu Peycelon, Sabine Irtan (Trousseau Hospital, APHP); Sabrina Dardenne, Elsa Robert (GHICL); Betty Maillot, Etienne Courboin, Alexis Pierre Arnaud, Juliette Hascoet (CHU Rennes); Olivier Abbo, Amir Ait Kaci, Thomas Prudhomme (CHU Toulouse); Quentin Ballouhey, Céline Grosos, Laurent Fourcade (CHU Limoges); Tolg Cecilia, Colombani Jean-Francois, Francois-Coridon Helene (CHU Martinique); Xavier Delforge, Elodie Haraux (CHU Amiens Picardie); Bertrand Dousset, Roberto Schiavone, Sebastien Gaujoux, (Cochin - APHP); Jean-Baptiste Marret, Aurore Haffreingue, Julien Rod (CHU Caen); Mariette Renaux-Petel (CHU Rouen); Jean-François Lecompte, Jean Bréaud, Pauline Gastaldi (CHU Lenval Nice); Chouikh Taieb, Raquillet Claire, Echaieb Anis (Hopital Robert Ballanger, Paris); Nasir Bustangi, Manuel Lopez, Aurelien Scalabre (CHU De Saint Etienne); Maria Giovanna Grella (CHU Poitiers); Aurora Mariani, Guillaume Podevin, Françoise Schmitt (CHU Angers); Erik Hervieux, Aline Broch, Cecile Muller (Hopital Necker Enfants Malades, APHP); **Ghana**: Stephen Tabiri, Anyomih Theophilus Teddy Kojo, Dickson Bandoh, Francis Abantanga, Martin Kyereh, Hamza Asumah, Eric Kofi Appiah, Paul Wondoh (Tamale Teaching Hospital); Adam Gyedu, Charles Dally, Kwabena Agbedinu, Michael Amoah, Abiboye Yifieyeh, (Kwame Nkrumah University of Science and Technology/ Komfo Anokye Teaching Hospital); Frank Owusu (St. Particks Hospital); Mabel Amoako-Boateng, Makafui Dayie, Richmond Hagan, Sam Debrah, (Cape Coast Teaching Hosital); Micheal Ohene-Yeboah, Joe-Nat Clegg-Lampety, Victor Etwire, Jonathan Dakubo, Samuel Essoun, William Bonney, Hope Glover-Addy, Samuel Osei-Nketiah, Joachim Amoako, Niiarmah Adu-Aryee, William Appeadu-Mensah, Antoinette Bediako-Bowan, Florence Dedey (Korle Bu Teaching Hospital); Mattew Ekow, Emmanuel Akatibo, Musah Yakubu (Baptist Medical Center, Nalerigu); Hope Edem Kofi Kordorwu, Kwasi Asare-Bediako, Enoch Tackie (Keta Hospital District Hospital, Keta); Kenneth Aaniana, Emmanuel Acquah, Richard Opoku-Agyeman, Anthony Avoka, Kwasi Kusi, Kwame Maison, (Techiman Holy Family Hospital); Frank Enoch Gyamfi (Berekum Holy Family Hospital); Gandau Naa Barnabas, Saiba Abdul-Latif (Upper West Regional Hospital); Philip Taah Amoako (Samapa Government Hospital); Anthony Davor, Victor Dassah (Upper East Regional Hospital); Enoch Dagoe (St. Mary's Hospital); Prince Kwakyeafriyie (Essumejaman Sda Hospital, Dominase); Elliot Akoto, Eric Ackom, Ekow Mensah (Dormaa Presbyterian Hospital); Ebenezer Takyi Atkins, Christian Lari Coompson (Brongho-Ahafo Regional Hospital, Sunyani); **Greece:** Nikolaos Ivros, Christoforos Ferousis, Vasileios Kalles, Christos Agalianos, Ioannis Kyriazanos, Christos Barkolias, Angelos Tselos, Georgios Tzikos, Evangelos Voulgaris (Naval And Veterans Hospital); Dimitrios Lytras, Athanasia Bamicha, Kyriakos Psarianos (Achillopoyleio General Hospital Of Volos); Anastasios Stefanopoulos (General Hospital Of Nafplio, Department Of Surgery); Ioannis Patoulias, Dimitrios Sfougaris, Ioannis Valioulis (G. Gennimatas Hospital); Dimitrios Balalis, Dimitrios Korkolis, Dimitrios K Manatakis (Saint Savvas Cancer Hospital); Georgios Kyrou, Georgios Karabelias, Iason-Antonios Papaskarlatos (General And Oncological Hospital Of Kifissia-Athens); Kolonia Konstantina, Nikolaos Zampitis, Stylianos Germanos (General Hospital Of Larissa); Aspasia Papailia, Theodosios Theodosopoulos, Georgios Gkiokas (2nd Dept Of Surgery, Aretaieion Hospital, National & Kapodistrian University Of Athens School Of Medicine); Magdalini Mitroudi, Christina Panteli, Thomas Feidantsis, Konstantinos Farmakis, (G. Gennimatas General Hospital); Dimitrios Kyziridis, Orestis Ioannidis, Styliani Parpoudi (4th Surgical Department, Aristotle University Of

Thessaloniki, General Hospital, Papanikolaou); Georgios Gemenetzis, Stavros Parasyris (Attikon University Hospital); Christos Anthoulakis, Nikolaos Nikoloudis, Michail Margaritis (Serres General Hospital); **Guatemala:** Maria-Lorena Aguilera-Arevalo, Otto Coyoy-Gaitan, Javier Rosales (Hospital General San Juan De Dios); Luis Tale, Rafael Soley, Emmanuel Barrios (Juan Josè Arevalo Bermejo); Servio Tulio Torres Rodriguez, Carlos Paz Galvez, Danilo Herrera Cruz (Hospital San Vicente); Guillermo Sanchez Rosenberg, Alejandro Matheu, David Monterroso Cohen (Hospital Herrera Llerandi); **Haiti:** Marie Paul, Angeline Charles (Hopital Universitaire De Mirebalais); **Hong Kong SAR, China:** Justin Chak Yiu Lam, Man Hon Andrew Yeung, Chi Ying Jacquelyn Fok, Ka Hin Gabriel Li, Anthony Chuk-Him Lai, Yuk Hong Eric Cheung, Hong Yee Wong, Ka Wai Leung, Tien Seng Bryan Lee, Wai Him Lam, Weihei Dao, Stephanie Hiu-wai Kwok, Tsz-Yan Katie Chan, Yung Kok Ng, TWC Mak (Prince Of Wales Hospital); Qinyang Liu, Chi Chung Foo, James Yang, (University Of Hong Kong); **India:** Basant Kumar, Ankur Bhatnagar, Vijaid Upadhyaya, (Sanjay Gandhi Post Graduate Institute Of Medical Sciences); Sunil Kumar (Excelcare Hospital); Uday Muddebihal, Wasim Dar, KC Janardha (Manipal Hospital); Philip Alexander, Neerav Aruldas, (Lady Willingdon Hospital); **Indonesia:** Fidelis Jacklyn Adella, Anthonius Santoso Rulie, Ferdy Iskandar, Jonny Setiawan (Atma Jaya Hospital); Cicilia Viany Evajelista, Hani Natalie, Arlindawati Suyadi (Dr. Oen Surakarta Hospital); Rudy Gunawan, Herlin Karismaningtyas, Lusi Padma Sulistianingsih Mata, Ferry Fitriya Ayu Andika, Afifatun Hasanah, T Ariani Widiastini, Nurlaila Ayu Purwaningsih, Annisa Dewi Fitriana Mukin, Dina Faizatur Rahmah, Hazmi Dwinanda Nurqistan, Hasbi Maulana Arsyad, Novia Adhitama (Rsd Dr Soebandi); Wifanto Saditya Jeo, Nathania Sutandi, Audrey Clarissa, Phebe Anggita Gultom, Matthew Billy, Andreass Haloho, Radhian Amandito, Nadya Johanna, Felix Lee (Rsupn Cipto Mangunkusumo); **Ireland:** Radin Mohd Nurrahman Radin Dorani, Martha Glynn, Mohammad Alherz, Wennweoi Goh, Haaris A. Shiwani, Lorraine Sproule, Kevin C. Conlon (Tallaght Hospital, Trinity College Dublin) **Israel:** Miklosh Bala, Asaf Kedar (Hadassah Hebrew University Medical Center); **Italy:** Luca Turati, Federica Bianco, Francesca Steccanella, (Treviglio Hospital); Gaetano Gallo, Mario Trompetto, Giuseppe Clerico (Department of Colorectal Surgery, S. Rita Clinic, Vercelli); Matteo Papandrea, Giuseppe Sammarco, Rosario Sacco (Department of Medical and Surgical Sciences, Policlinico Universitario Mater Domini Campus Salvatore Venuta, Catanzaro); Angelo Benevento, Francesco Pata, Luisa Giavarini (Sant'Antonio Abate Hospital, Gallarate); Mariano Cesare Giglio, Luigi Bucci, Gianluca Pagano, Viviana Sollazzo, Roberto Peltrini, Gaetano Luglio (Federico II University Of Naples); Arianna Birindelli, Salomone Di Saverio, Gregorio Tugnoli (Maggiore Hospital); Miguel Angel Paludi, Pietro Mingrone, Domenica Pata (Nicola Giannettasio Hospital, Rossano); Francesco Selvaggi, Lucio Selvaggi, Gianluca Pellino, Natale Di Martino (Universitá della Campania "Luigi Vanvitelli", Naples); Gianluca Curletti, Paolo Aonzo, Raffaele Galleano (Ospedale Santa Corona, Pietra Ligure (SV)); Stefano Berti, Elisa Francone, Silvia Boni, (S. Andrea Hospital, Poll-Asl 5, La Spezia), Laura Lorenzon, Annalisa lo Conte, Genoveffa Balducci (Sant'Andrea Hospital, Sapienza University of Rome); Gianmaria Confalonieri, Giovanni Pesenti (Azienda Ospedaliera Alessandro Manzoni); Laura Gavagna, Giorgio Vasquez, Simone Targa, Savino Occhionorelli, Dario Andreotti (Azienda Ospedaliero-Universitaria Di Ferrara); Giacomo Pata, Andrea Armellini, Deborah Chiesa (A.O. Spedali Civili Di Brescia); Fabrizio Aquilino, Nicola Chetta, Arcangelo Picciariello (Azienda Ospedaliero Universitaria Consorziale Policlinico Di Bari); Mohamed Abdelkhalek, Andrea Belli, Silvia De Franciscis (Istituto Nazionale Tumori Fondazione, Pascale-I.R.C.C.S.); Annamaria Bigaran, Alessandro Favero, Stefano M.M Basso (Azienda Per L'assistenza Sanitaria N. 5 Friuli Occidentale); Paola Salusso, Martina Perino, Sylvie Mochet, Diego Sasia, Francesco Riente, Marco Migliore (Azienda Sanitaria Ospedaliera San Luigi Gonzaga); David Merlini, Silvia Basilicò, Carlo Corbellini (Ospedale Di Rho - ASST Rhodense); Veronica Lazzari, Yuri Macchitella, Luigi Bonavina (IRCCS Policlinico, University of Milano, San Donato); Daniele Angelieri, Diego Coletta, Federica Falaschi, Marco Catani, Claudia Reali, Mariastella Malavenda, Celeste Del Basso, Sergio Ribaldi, Massimo Coletti, Andrea Natili, Norma Depalma, Immacolata Iannone, Angelo Antoniozzi, Davide Rossi (Policlinico Umberto I Emergency Surgery Department); Daniele Gui, Gerardo Perrotta, Matteo Ripa, Francesco Ruben Giardino, Maurizio Foco, (Fondazione Policlinico Universitario Agostino Gemelli); Erika Vicario, Federico Coccolini, Luca Ansaloni, Gabriela Elisa Nita (AO Papa Giovanni XXIII); Nicoletta Leone, Andrea Bondurri, Anna Maffioli (Ospedale Sacco); Andrea Simioni, Davide De Boni, Sandro Pasquali (IOV - Istituto Oncologico Veneto); Elena Goldin, Elena Vendramin, Eleonora Ciccioli (Azienda Ospedaliera di Padova); Umberto Tedeschi, Luca Bortolasi, Paola Violi, Tommaso Campagnaro, Simone Conci, Giovanni Lazzari, Calogero Iacono, Alfredo Gulielmi, Serena Manfreda (Azienda Ospedaliera Universitaria Integrata di Verona); Anna Rinaldi, Maria Novella Ringressi, Beatrice Brunoni (Azienda Ospedaliera Universitaria Careggi); Giuseppe Salamone, Mirko Mangiapane, Paolino De Marco, Antonella La Brocca, Roberta Tutino, Vania Silvestri, Leo Licari, Tommaso Fontana, Nicolò Falco, Gianfranco Cocorullo, (Policlinico Paolo Giaccone di Palermo); Mostafa Shalaby, Pierpaolo Sileri, Claudio Arcudi (Policlinico Tor Vergata Hospital, Rome); **Jordan:** Isam Bsisu, Khaled Aljboor, Lana Abusalem, Aseel Alnusairat, Ahmad Qaissieh, Emad Al-Dakka, Ali Ababneh, Oday Halhouli (Jordan University Hospital); **Kenya:** Taha Yusufali, Hussein Mohammed (Kenyatta National Hospital); Justus Lando, Robert Parker, Wairimu Ndegwa (Tenwek Hospital); **Lithuania:** Mantas Jokubauskas, Jolanta Gribauskaite, Donatas Venskutonis (Lithuanian University Of Health Sciences); Justas Kuliavas, Audrius Dulskas, Narimantas E. Samalavicius (Klaipeda University Hospital, National Cancer Institute); Kristijonas Jasaitis, Audrius Parseliunas, Viktorija Nevieraite, Margarita Montrimaite, Evelina Slapelyte, Edvinas Dainius, Romualdas Riauka, Zilvinas Dambrauskas, Andrejus Subocius, Linas Venclauskas, Antanas Gulbinas, Saulius Bradulskis, Simona Kasputyte, Deimante Mikuckyte, Mindaugas Kiudelis, Justas Zilinskas, Tomas Jankus, Steponas Petrikenas (Lithuanian University of Health Sciences); Matas Pažuskis, Zigmantas Urniežius, Mantas Vilčinskas (Republican Hospital of Kaunas); Vincas Jonas Banaitis, Vytautas Gaižauskas, Edvard Grisin, Povilas Mazrimas, Rokas Rackauskas, Mantas Drungilas, Karolis Lagunavicius, Vytautas Lipnickas, Dovilè Majauskyté, Valdemaras Jotautas, Tomas Abaliksta, Laimonas Uščinas, Gintaras Simutis, Adomas Ladukas, Donatas Danys, Erikas Laugzemys, Saulius Mikalauskas, Tomas Poskus, Elena Zdanyte Sruogiene, (Vilnius University Hospital); Petras Višinskas, Reda Žilinskienė, Deividas Dragatas (Hospital Of Jonava); Andrius Burmistrovas, Zygimantas Tverskis (Taurage Hospital); Arturas Vaicius, Ruta Mazelyte, Antanas Zadoroznas (Viesoji Įstaiga Rokiskio Rajono Ligonine); Nerijus Kaselis, Greta Žiubrytė, (Republican Hospital Of Klaipeda);

Madagascar: Finaritra Casimir Fleur Prudence Rahantasoa, Luc Hervé Samison, Fanjandrainy Rasoaherinomenjanahary, Todisoa Emmanuella Christina Tolotra (Joseph Ravoahangy Andrianavalona Hospital); **Malawi:** Cornelius Mukuzunga, Vanessa Msosa, Chimwemwe Kwatiwani, Nelson Msiska (Kamuzu Central Hospital); **Malaysia:** Feng Yih Chai, Siti Mohd Desa Asilah, Khuzaimah Zahid Syibrah (Hospital Keningau); Pui Xin Chin, Afizah Salleh, Nur Zulaika Riswan (Kajang Hospital); April Camilla Roslani, Hoong-Yin Chong, Nora Abdul Aziz, Keat-Seong Poh, Chu-Ann Chai, Sandip Kumar (University Malaya Medical Centre); Mustafa Mohammed Taher, Nik Ritza Kosai, Dayang Nita Abdul Aziz, Reynu Rajan (Universiti Kebangsaan Malaysia Medical Centre UKMMC); Rokayah Julaihi, Durvesh Lacthman Jethwani, Muhammad Taqiyuddin Yahaya, Nik Azim Nik Abdullah, Susan Wndy Mathew, Kuet Jun Chung, Milaksh Kumar Nirumal, R. Goh Ern Tze, Syed Abdul Wahhab Eusoffee Wan Ali (Sarawak General Hospital); Yiing Yee Gan, Jesse Ron Swire Ting (Hospital Sibu); Samuel S. Y. Sii, Kean Leong Koay, Yi Koon Tan, Alvin Ee Zhiun Cheah, Chui Yee Wong, Tuan Nur'Azmah Tuan Mat, Crystal Yern Nee Chow, Prisca A.L. Har, Yishan Der (Hospital Sultanah Aminah); Yong Yong Tew, Fitjerald Henry, Xinwei Low (Selayang Hospital); Ya Theng Neo, Hian Ee Heng, Shu Ning Kong, Cheewei Gan, Yi Ting Mok, Yee Wen Tan, Kandasami Palayan, Mahadevan Deva Tata, Yih Jeng Cheong (Hospital Tuanku Ja'afar); Kuhaendran Gunaseelan, Wan Nurul 'Ain Wan Mohd Nasir, Pigeneswaren Yoganathan, (Hospital Keningau); Eu Xian Lee, Jian Er Saw, Li Jing Yeang, Pei Ying Koh, Shyang Yee Lim, Shuang Yi Teo (Hospital Pulau Pinang / Penang Medical College); **Malta:** Nicole Grech, Daniela Magri, Kristina Cassar, Christine Mizzi, Malcolm Falzon, Nihaal Shaikh, Ruth Scicluna, Stefan Zammit, Elaine Borg, Sean Mizzi, Svetlana Doris Brincat, Thelma Tembo, Vu Thanh Hien Le, Tara Grima, Keith Sammut, Kurt Carabott, Alexia Farrugia, Ciskje Zarb, Andre Navarro, Thea Dimech, Georgette Marie Camilleri, Isaac Bertuello, Jeffrey Dalli, Karl Bonavia (Mater Dei Hospital); **Mexico**: Samantha Corro-Diaz, Marisol Manriquez-Reyes, Antonio Ramos-De la Medina (Hospital Español de Veracruz); **Morocco**: Amina Abdelhamid, Abdelmalek Hrora, Sarah Benammi, Houda Bachri, Meryem Abbouch, Khaoula Boukhal, Redouane Mammar Bennai, Abdelkader Belkouchi, Mohamed Sobhi Jabal, Chaymae Benyaiche (IBN Sina Hospital); **Netherlands:** Maarten Vermaas, Lucia Duinhouwer, (Ijsselland Hospital); **Nicaragua:** Javier Pastora, Greta Wood, Maria Soledad Merlo (Hospital Escuela Oscar Danilo Rosales Arguello); **Nigeria:** Akinlabi Ajao, Omobolaji Ayandipo, Taiwo Lawal, Abdussemiu Abdurrazzaaq, (University College Hospital, Ibadan); Muslimat Alada, Abdulrasheed Nasir, James Adeniran, Olufemi Habeeb, Ademola Popoola, Ademola Adeyeye (University Of Ilorin Teaching Hospital,Ilorin); Ademola Adebanjo, Opeoluwa Adesanya, Adewale Adeniyi (Federal Medical Centre, Abeokuta,); Henry Mendel, Bashir Bello, Umar Muktar (Usmanu Danfodiyo University Teaching Hospital);); Adedapo Osinowo, Thomas Olagboyega Olajide, Oyindamola Oshati, George Ihediwa, Babajide Adenekan, Victor Nwinee, Felix Alakaloko, Adesoji Ademuyiwa, Olumide Elebute, Abdulrazzaq Lawal, Chris Bode, Mojolaoluwa Olugbemi (Lagos University Teaching Hospital); Alaba Adesina, Olubukola Faturoti, Oluwatomi Odutola, Oluwaseyi Adebola, Clement Onuoha, Ogechukwu Taiwo (Babcock University Teaching Hospital); Omolara Williams, Fatai Balogun, Olalekan Ajai, Mobolaji Oludara, Iloba Njokanma, Roland Osuoji (Lagos State University Teaching Hospital); Stephen Kache, Jonathan Ajah, Jerry Makama (Barau Dikko Teaching Hospital, Kaduna State University, Kaduna); Ahmed Adamu, Suleiman Baba, Mohammad Aliyu, Shamsudeen Aliyu, Yahaya Ukwenya, Halima Aliyu, Tunde Sholadoye, Muhammad Daniyan, Oluseyi Ogunsua (Ahmadu Bello University Teaching Hospital Zaria); Lofty-John Anyanwu, Abdurrahaman Sheshe, Aminu Mohammad (Aminu Kano Teaching Hospital); Samson Olori, Philip Mshelbwala, Babatunde Odeyemi, Garba Samson, Oyediran Kehinde Timothy, Sani Ali Samuel (University Of Abuja Teaching Hospital,); Anthony Ajiboye, Ademola Adeyeye, Isaac Amole, Olajide Abiola, Akin Olaolorun (Bowen University Teaching Hospital); **Norway:** Kjetil Søreide, Torhild Veen, Arezo Kanani, Kristian Styles, Ragnar Herikstad, Johannes Wiik Larsen, Jon Arne Søreide (Stavanger University Hospital); Elisabeth Jensen, Mads Gran, Eirik Kjus Aahlin (University Hospital Of Northern Norway); Tina Gaarder, Peter Wiel Monrad-Hansen, Pål Aksel Næss (Oslo University Hospital); Giedrius Lauzikas, Joachim Wiborg, Silje Holte (Sykehuset Telemark HF); Knut Magne Augestad, Gurpreet Singh Banipal, Michela Monteleone, Thomas Tetens Moe, Johannes Kurt Schultz (Akershus University Hospital); **Palestine:** Taher Al-taher, Ayah Hamdan, Ayman Salman, Rana Saadeh, Aseel Musleh, Dana Jaradat, Soha Abushamleh, Sakhaa Hanoun, Amjad Abu Qumbos, Aseel Hamarshi, Ayman And Taher (Al Makassed Islamic Charitable Society Hospital, Jerusalem); Israa Qawasmi, Khalid Qurie, Marwa Altarayra, Mohammad Ghannam, Alaa Shaheen, Azher Herebat (Alia Governmental Hospital); Aram Abdelhaq, Ahmad Shalabi, Maram Abu-toyour, Fatema Asi, Ala Shamasneh, Anwar Atiyeh, Mousa Mustafa, Rula Zaa'treh, Majd Dabboor (Palestine Medical Complex); Enas Alaloul, Heba Baraka, Jehad Meqbil, Alaa Al-Buhaisi, Mohamedraed Elshami, Samah Afana, Sahar Jaber, Said Alyacoubi, Yousef Abuowda (Islamic University of Gaza Medical School, European Gaza Hospital & Shifa Hospital); Tasneem Idress, Eman Abuqwaider (Mizan hospital); Sara Al-saqqa, Alaa Bowabsak, Alaa El Jamassi, Doaa Hasanain, Hadeel Al-farram, Maram Salah, Aya Firwana, Marwa Hamdan, Israa Awad (Al-Shifa Hospital); Ahmad Ashour, Fayez Elian Al Barrawi (Bit Hanoun Hospital); Ahmed Al-khatib, Maha Al-faqawi, Mohamed Fares (Nasser Hospital); Amjad Elmashala, Mohammad Adawi, Ihdaa Adawi (Beit Jala Governmental Hospital); Reem Khreishi, Rose Khreishi (Martyr Thabet Govermental hospital, Tulkarem); Ahmad ashour, Ahed Ghaben (Indonesian Hospital, Gaza); **Pakistan:** Najwa Nadeem, Muhammad Saqlain (Allied Hospital, Faisalabad); Jibran Abbasy, Abdul Rehman Alvi, Tanzeela Gala, Noman Shahzad (Aga Khan University); Kamran Faisal Bhopal, Zainab Iftikhar, Muhammad Talha Butt, Syed Asaat ul Razi, Asdaq Ahmed, Ali Khan Niazi (Bahawal Victoria Hospital); Ibrahim Raza, Fatima Baluch, Ahmed Raza, Ahmad Bani-Sadar, Ahmad Uzair Qureshi, Muhammad Adil, Awais Raza, (King Edward Medical University, Mayo Hospital, Lahore); Mahnoor Javaid, Muhammad Waqar, Maryam Ali Khan (CMH Lahore Medical And Dental College); Mohammad Mohsin Arshad, Mohammadasim Amjad (Nishtar Medical College And Hospital); **Paraguay:** Gustavo Miguel Machain Vega, Jorge Torres Cardozo, Marcelo O´Higgins Roche, Gustavo Rodolfo Pertersen Servin, Helmut Alfredo Segovia Lohse, Larissa Ines Páez Lopez, Ramón Augusto Melo Cardozo (Hospital de Clínicas, II Cátedra de Clínica Quirúrgica, Universidad Nacional de Asunción); **Peru:** Fernando Espinoza, Angel David Pérez Rojas, Diana Sanchez, Camila Sanchez Samaniego, Shalon Guevara Torres, Alexander Canta Calua, Cesar Razuri, Nadia Ortiz, Xianelle Rodriguez, Nahilia Carrasco, Fridiz Saravia, Hector Shibao Miyasato, María Valcarcel-

Saldaña, Ysabel Esthefany Alejos Bermúdez, Juan Carpio, Walter Ruiz Panez, Pedro Angel Toribio Orbegozo, (Hospital Nacional Arzopispo Loayza); Carolina Guzmán Dueñas, Kevin Turpo Espinoza, Ana Maria Sandoval Barrantes, Jorge Armando Chungui Bravo, Sebastian Shu, Lorena Fuentes-Rivera, Carmen Fernández, Diego Romani, Bárbara Málaga, Joselyn Ye (Hospital Cayetano Heredia); Ricardo Velasquez, Jannin Salcedo (Clínica De Especialidades Médicas); Ana Lucia Contreras-Vergara, Angelica Genoveva Vergara Mejia, Maria Soledad Gonzales Montejo (Hospital Nacional Guillermo Almenara Irigoyen); Marilia Del Carmen Escalante Salas, Willy Alcca Ticona, Marvin Vargas, George Christian Manrique Sila, Robinson Mas, Arazzelly del Pilar Paucar (Hospital Regional De Ayacucho); Armando José Román Velásquez, Alina Robledo-Rabanal, Ludwing Alexander Zeta Solis, (Hospital III José Cayetano Heredia); Kenny Turpo Espinoza (Hospital Nacional Maria Auxiliadora); José Luis Hamasaki Hamaguchi, Erick Samuel Florez Farfan, Linda Alvi Madrid Barrientos, Juan Jaime Herrera Matta (Hospital De Policia); **Philippines:** John Jemuel V. Mora, Menold Archee P. Redota, Manuel Francisco Roxas, Maria Jesusa B. Maño, (The Medical City); Marie Dione Parreno-Sacdalan, Marie Carmela Lapitan, Christel Leanne Almanon (Department Of Surgery, Philippine General Hospital, University Of The Philippines Manila); **Poland:** Maciej Walędziak, Rafał Roszkowski, Michał Janik (Department Of General, Oncological, Metabolic And Thoracic Surgery, Military Institute Of Medicine, Warsaw); Anna Lasek, Piotr Major, Dorota Radkowiak, Mateusz Rubinkiewicz (2nd Department Of Surgery, Jagiellonian University Medical College); **Portugal:** Cristina Fernandes, Jose Costa-Maia, Renato Melo (Centro Hospitalar De São João); **Romania:** Liviu Muntean, Aurel Sandu Mironescu, Lucian Corneliu Vida (Spitalul Clinic De Copii Brasov); Amar Kourdouli, Mariuca Popa (Spital Judetean De Urgenta Din Craiova); Hogea Mircea (Spitalul Clinic Judetean Brasov); Mihaela Vartic, Bogdan Diaconescu, Matei Razvan Bratu, Ionut Negoi, Mircea Beuran, Cezar Ciubotaru (Emergency Hospital of Bucharest); **Rwanda:** J. C Allen Ingabire, Alphonse Zeta Mutabazi, Norbert Uzabumwana (University Teaching Hospital Of Kigali); Dieudonne Duhoranenayo (Kibungo Hospital); **San Marino:** Elio Jovine, Nicola Zanini, Giovanni Landolfo (San Marino State Hospital); **Saudi Arabia:** Murad Aljiffry, Faisal Idris, Mohammed Saleh A. Alghamdi, Ashraf Maghrabi, Abdulmalik Altaf, Aroub Alkaaki, Ahmad Khoja, Abrar Nawawi, Sondos Turkustani, (Department of Surgery, Faculty of Medicine, King Abdulaziz University Hospital, Jeddah) Eyad Khalifah, Ahmad Gudal, Adel Albiety, Sarah Sahel, Reham Alshareef, Mohammed Najjar (Department of Surgery, King Abdulaziz University Hospital and Oncology Center, Jeddah) Ahmed Alzahrani, Ahmed Alghamdi, Wedyan Alhazmi, (King Fahad Hospital, Jeddah) Ghiath Al Saied, Mohammed Alamoudi, Muhammed Masood Riaz (King Fahad Medical City, Riyadh); Mazen Hassanain, Basmah Alhassan, Abdullah Altamimi, Reem Alyahya, Norah Al Subaie, Fatema Al Bastawis, Afnan Altamimi, Thamer Nouh, Roaa Khan, (King Khaled University Hospital); **Serbia:** Milan Radojkovic, Ljiljana Jeremic, Milica Nestorovic (Clinic For General Surgery, Clinical Center Nis); **Singapore:** Jia Hao Law, Keith Say Kwang Tan, Ryan Choon Kiat Tan, Joel Kin Tan, Lau Wen Liang Joel, Bettina Lieske, Xue Wei Chan, Faith Qi Hui Leong, Choon Seng Chong, Sharon Koh, Kai Yin Lee, Kuok Chung Lee (National University Hospital); **South Africa:** Kent Pluke, Britta Dedekind, Puyearashid Nashidengo, Mark Ian Hampton (Victoria Hospital Wynberg); Johanna Joosten, Sanju Sobnach, Liana Roodt, Anthony Sander, James Pape, Richard Spence (Groote Schuur); Niveshni Maistry (Charlotte Maxeke Johannesburg Academic Hospital); Phumudzo Ndwambi, Kamau Kinandu, Myint Tun (Leratong Hospital); Frederick Du Toit, Quinn Ellison, Sule Burger, DC Grobler, Lawrence Bongani Khulu (Tembisa Tertiary Provincial Hospital); Rachel Moore, Vicky Jennings, Astrid Leusink (Chris Hani Baragwanath Academic Hospital); Nazmie Kariem, Juan Gouws, Kathryn Chu, Heather Bougard, Fazlin Noor, Angela Dell (New Somerset Hospital); Sarah Rayne, Stephanie Van Straten, (Helen Joseph Hospital, University Of Witwatersrand); Arvin Khamajeet, Serge Kapenda Tshisola, Kalangu Kabongo (Stanger Hospital); Victor Kong (Edendale Hospital); Yoshan Moodley, Frank Anderson, Thandinkosi Madiba (Inkosi Albert Luthuli Central Hospital); Flip du Plooy (Mediclinic Potchefstroom); Leila Hartford, Gareth Chilton, Parveen Karjiker (Mitchell's Plain District Hospital); Matlou Ernest Mabitsela, Sibongile Ruth Ndlovu (Dr George Mukhari Academic Hospital); Maria Badicel, Robert Jaich (Milpark Hospital); **Spain:** Jaime Ruiz-Tovar (University Hospital Rey Juan Carlos); Luis Garcia-Florez, Jorge L. Otero-Díez, Virginia Ramos Pérez, Nuria Aguado Suárez (Hospital Universitario San Agustín); Javier Minguez García, Sara Corral Moreno, Maria Vicenta Collado , Virginia Jiménez Carneros, Javier García Septiem (Hospital Universitario de Getafe); Mariana Gonzalez, Antonio Picardo, Enrique Esteban, Esther Ferrero, Irene Ortega, (Infanta Sofía University Hospital); Eloy Espin-Basany, Ruth Blanco-Colino, Valeria Andriola (Hospital Valle De Hebron); Lorena Solar García, Elisa Contreras, Carmen García Bernardo, Janet Pagnozzi, Sandra Sanz, Alberto Miyar de León, Asnel Dorismé, Joseluis Rodicio, Aida Suarez, Jessica Stuva, Tamara Diaz Vico (Central University Hospital Of Asturias); Laura Fernandez-Vega, Carla Soldevila-Verdeguer, Fatima Sena-Ruiz, Natalia Pujol-Cano, Paula Diaz-Jover, José Maria Garcia-Perez, Juan Jose Segura-Sampedro, Cristina Pineño-Flores, David Ambrona-Zafra, Andrea Craus-Miguel, Patricia Jimenez-Morillas, Angela Mazzella (Hospital Universitario Son Espases); **Sri Lanka**: A.B Jayathilake, S.P.B Thalgaspitiya, L.S. Wijayarathna, P.M.S.N. Wimalge (University Surgical Unit, Teaching Hospital Anuradhapura); **St. Kitts And Nevis:** Hakeem Ayomi Sanni, Aliyu Ndajiwo, Ogheneochuko Okenabirhie (Joseph N France Hospital); **Sudan:** Anmar Homeida, Abobaker Younis, Omer Abdelbagi Omer, Mustafa Abdulaziz, Ali Mussad, Ali Adam (University of Gezira); **Sweden:** Yucel Cengiz, Ida Björklund, Sandra Ahlqvist, Sandra Ahlqvist, (Sundsvall Hospital); Anders Thorell, Fredrik Wogensen (Ersta Hospital); Arestis Sokratous, Michaela Breistrand (Mora Hospital); Hildur Thorarinsdottir (Helsingborgs Lasarett); Johanna Sigurdadottir, Maziar Nikberg, Abbas Chabok (Västmanlands Hospital Västerås); Maria Hjertberg (Department Of Surgery And Department Of Clinical And Experimental Medicine, Linköping University, Norrköping, Sweden); Peter Elbe, Deborah Saraste, Wiktor Rutkowski, Louise Forlin (Karolinska Universitetssjukhuset, Solna); Karoliina Niska, Malin Sund (Umea University Hospital); **Switzerland:** Dennis Oswald, Georgios Peros, Rafael Bluelle, Katharina Reinisch, Daniel Frey, Adrian Palma (Gzo Spital Wetzikon); Dimitri Aristotle Raptis, Lucius Zumbühl, Markus Zuber (Kantonsspital Olten); Roger Schmid, Gabriela Werder (Buergerspital Solothurn); Antonio Nocito, Alexandra Gerosa, Silke Mahanty (Kantonsspital Baden); Lukas Werner Widmer, Julia Müller, Alissa Gübeli (Hospital Davos); Grzegorz Zuk (Gzo Spital Wetzikon); **Turkey:** Osman Bilgin Gulcicek, Yuksel Altinel, Talar Vartanoglu, (Bagcilar Research And Training Hospital); Emin Kose, Servet Rustu

Karahan, Mehmet Can Aydin (Okmeydanı Training And Research Hospital); Nuri Alper Sahbaz, Ilkay Halicioglu, Halil Alis (Bakirkoy Dr. Sadi Konuk Training And Research Hospital); Ipek Sapci, Can Adıyaman, Ahmet Murat Pektaş, Turgut Bora Cengiz, Ilkan Tansoker, Vedatcan Işler, Muazzez Cevik, Deniz Mutlu, Volkan Ozben, Berk Baris Ozmen, Sefa Bayram, Sinem Yolcu, Berna Buse Kobal, Ömer Faruk Toto, Haluk Cem Çakaloğlu (Acibadem University School of Medicine, Atakent Hospital); Kagan Karabulut, Vahit Mutlu, Bahar Busra Ozkan (Ondokuz Mayis University Medical Faculty); Saban Celik, Anil Semiz, Selim Bodur, Enisburak Gül, Busra Murutoglu, Reyyan Yildirim, Bahadir Emre Baki, Ekin Arslan, Mehmet Ulusahin, Ali Guner (Karadeniz Technical University Faculty Of Medicine); **United Kingdom:** Nathan Walker, Nikhita Shrimanker, Michael Stoddart, Simon Cole (Royal United Hospital Bath); Ryan Breslin, Ravi Srinivasan (Blackpool Victoria Hospital); Mohamed Elshaer, Kristina Hunter, Ahmed Al-Bahrani (Watford General Hospital); Ignatius Liew, Nora Grace Mairs, Alistair Rocke, Lachlan Dick, Mobeen Qureshi (Inverclyde Royal Hospital); Debkumar Chowdhury (University Hospital Ayr); Naomi Wright, Clare Skerritt, Dorothy Kufeji (Guy's And St. Thomas' Hospitals); Adrienne Ho, Tharindra Dissanayake, Athula Tennakoon, Wadah Ali, (Pilgrim Hospital, United Lincolnshire Hospitals NHS Trust); Shujing Jane Lim, Charlene Tan, Stephen O'Neill, Catrin Jones (Victoria Hospital Kirkcaldy); Stephen Knight, Dima Nassif, Abhishek Sharma (Perth Royal Infirmary); Oliver Warren, Rebecca White, Aia Mehdi, Nathan Post, Eliana Kalakouti, Enkhbat Dashnyam, Frederick Stourton (Chelsea And Westminster Hospital); Ioannis Mykoniatis, Chelise Currow, (Northampton General Hospital); Francisca Wong, Ashish Gupta, Veeranna Shatkar (Queen's Hospital, BHR University Hospitals NHS Trust); Joshua Luck, Suraj Kadiwar, Alexander Smedley (North Middlesex University Hospital); Rebecca Wakefield, Philip Herrod, James Blackwell, Jonathan Lund, (Royal Derby Hospital); Fraser Cohen, Ashwath Bandi, Stefano Giuliani (St George's Hospital); Giles Bond-Smith, Theodore Pezas, Neda Farhangmehr, Tomas Urbonas, Miklos Perenyei (John Radcliffe Hospital, Oxford); Philip Ireland, Natalie Blencowe, Kirk Bowling, David Bunting (Gloucestershire Royal Hospital); Lydia Longstaff, Neil Smart, Kenneth Keogh (Royal Devon & Exeter Hospital); Hyunjin Jeon, Muhammad Rafaih Iqbal, Shivun Khosla, Anna Jeffery, James Perera (Maidstone & Tunbridge Wells NHS Trust); Ella Teasdale (Western Isles Hospital); Ahmad Aboelkassem Ibrahem, Tariq Alhammali, Yahya Salama (Kettering General Hospital NHS Trust); Rakan Kabariti, Shaun Oram (Nevill Hall Hospital); Thomas Kidd, Fraser Cullen, Christopher Owen, Michael Wilson, Seehui Chiu, Hannah Sarafilovic, (Ninewells Hospital); Jennifer Ploski, Elizabeth Evans, Athar Abbas, Sylvia Kamya, Norzawani Ishak, Carly Bisset, Cedar Andress, Ye Ru Chin (Royal Alexandra Hospital, Paisley); Priya Patel, David Evans (University Hospital, Wales); Anna Jeffery, James Perera (Maistone and Tunbridge Wells NHS Trust); Aidan Haslegrave, Adam Boggon, Kirsten Laurie, Katie Connor, Thomas Mann (Borders General Hospital); Dmitri Nepogodiev, Anahita Mansuri, Rachel Davies, Ewen Griffiths (University Hospitals Birmingham NHS Trust); Aized Raza Shahbaz, Calvin Eng, Farhat Din, Ariadne L'Heveder, Esther H.G. Park, Ramanish Ravishankar, Kirsten McIntosh, Jih Dar Yau, Luke Chan, Susan McGarvie (Western General Hospital, Edinburgh); Lingshan Tang, Hui Lim, Suhhuey Yap, Jay Park, Zhan Herr Ng, Shahrukh Mirza, Yun Lin Ang, Luke Walls, Ella Teasdale, Chloe Roy, Simon Paterson-Brown, Julian Camilleri-Brennan, Kenneth Mclean, Michelle S D'Souza, Savva Pronin, David Ewart Henshall, Eunice Zuling Ter (Royal Infirmary Of Edinburgh); Dina Fouad, Ashish Minocha (Norfolk And Norwich University Hospital); William English, Catrin Morgan, Dominic Townsend, Laura Maciejec, Shareef Mahdi, Onyinye Akpenyi, Elisabeth Hall, Hanaan Caydiid, Zakaria Rob, Tom Abbott, Hew D Torrance (The Royal London Hospital); Gareth Irwin, Robin Johnston (Ulster Hospital Dundonald); Mohammed Akil Gani, Gianpiero Gravante (Leicester Royal Infirmary); Shivanchan Rajmohan, Kiran Majid, Shiva Dindyal, Christopher Smith (West Middlesex University Hospital); Madanmohan Palliyil, Sanjay Patel, Luke Nicholson, Neil Harvey, Katie Baillie, Sam Shillito, Suzanne Kershaw, Rebecca Bamford, Peter Orton (Stockport NHS Foundation Trust); Elke Reunis, Robert Tyler, Wai Cheong Soon (Good Hope Hospital); Guled M. Jama, Dharminder Dhillon, Khyati Patel (Walsall Manor Hospital, Walsall); Shayanthan Nanthakumaran, Rachel Heard, Kar Yan Chen (Aberdeen Royal Infirmary); Behrad Barmayehvar, Uttaran Datta, Sivesh K Kamarajah, Sharad Karandikar (Heartlands Hospital); Sobhana Iftekhar Tani (Nottingham University Hospital NHS Trust); Eimear Monaghan, Philippa Donnelly, Michael Walker (Raigmore Hospital); Jehangirshaw Parakh, Sarah Blacker, Anil Kaul (Whiston Hospital); Arjun Paramasivan (Darlington Memorial Hospital); Sameh Farag, Ashrafun Nessa, Salwa Awadallah (Worthing Hospital, Western Sussex Hospital NHS Foundation Trust); Jieqi Lim, James Chean Khun Ng (Queen Elizabeth University Hospital, Glasgow); **United States**: Katherine Gash, Ravi P. Kiran, Alice Murray (New York Presbyterian Hospital/ Columbia University Medical Center); Eric Etchill, Mohini Dasari, Juan Puyana (University Of Pittsburgh Medical Center - Presbyterian); Nadeem Haddad, Martin Zielinski, Asad Choudhry (Mayo Clinic); Celeste Caliman, Mieshia Beamon, Therese Duane (John Peter Smith Hospital); Ragavan Narayanan, Mamta Swaroop (Northwestern Memorial Hospital / Northwestern University); Jonathan Myers, Rebecca Deal, Erik Schadde (Rush University Medical Centre); Mark Hemmila, Lena Napolitano, Kathleen To (University Of Michigan Medical Center); **Zambia**: Alex Makupe, Joseph Musowoya, Mayaba Maimbo (Ndola Central Hospital); Niels Van Der Naald, Dayson Kumwenda, Alex Reece-Smith, Kars Otten, Anna Verbeek, Marloes Prins (St Francis Mission Hospital)

GlobalSurg-2 Data validators: **Argentina**: Alibeth Andres Baquero Suarez (Simplemente Evita), Ruben Balmaceda (Hospital Lagomaggiore); **Barbados**: Chelsea Deane (Queen Elizabeth Hospital); **Croatia**: Emilio Dijan (Zadar General Hospital); **Egypt**: Mahmoud Elfiky (Kasr Al Ainy Faculty of Medicine, Cairo University); **Finland**: Laura Koskenvuo (Helsinki University Hospital); **France**: Aurore Thollot (CHU Poitiers), Bernard Limoges (CHU Limoges), Carmen Capito (Hopital Necker Enfants Malades, APHP), Challine Alexandre (Hopital Cochin, APHP), Henri Kotobi (Trousseau Hospital, APHP), Julien Leroux (CHU Rouen), Julien Rod (CHU Caen), Kalitha Pinnagoda (CHU Toulouse), Nicolas Henric (CHU Angers), Olivier Azzis (CHU Rennes), Olivier Rosello (CHU Nice), Poddevin Francois (GHICL), Sara Etienne (CHU Saint Etienne); Philippe Buisson (CHU Amiens Picardie), Sophian Hmila (Hopital Robert Ballanger, Paris); **Ghana**: Joe-Nat Clegg-Lamptey (Korle Bu Teaching Hospital), Osman Imoro (Baptist Medical Centre), Owusu Emmanuel Abem (Komfo Anokye Teaching Hospital), Paul Wondoh (Upper West Regional Hospital); **Greece**: Dimitrios Papageorgiou (Naval And Veterans Hospital Of Athens), Vasiliki Soulou (Anticancer Hospital Of Athens Agios Savvas); **Guatemala**: Sabrina Asturias (Hospital Herrera Llerandi Amedesgua), Lenin Peña (Hospital General

San Juan De Dios); **India**: Basant Kumar (Sanjay Gandhi Post Graduate Institute Of Medical College Lucknow); **Ireland**: Donal B O'Connor (Tallaght Hospital, Trinity College Dublin); **Italy**: Alberto Realis Luc (Santa Rita Clinic, Vercelli), Alfio Alessandro Russo (Treviglio Hospital), Andrea Ruzzenente (Azienda Ospedaliera Universitaria Integrata di Verona), Antonio Taddei (Azienda Ospedaliera Universitaria Careggi), Camilla Cona (IOV - Istituto Oncologico Veneto), Corrado Bottini (Sant'Antonio Abate Hospital, Gallarate), Giovanni Pascale (Azienda Ospedaliero-Universitaria di Ferrara), Giuseppe Rotunno (Nicola Giannettasio Hospital, Rossano), Leonardo Solaini (University Of Brescia, Spedali Civili Di Brescia), Marco Maria Pascale (Fondazione Policlinico Universitario 'Agostino Gemelli'), Margherita Notarnicola (University Of Bari 'Aldo Moro'), Mario Corbellino (Ospedale Luigi Sacco Milano), Michele Sacco (Federico II University of Naples), Paolo Ubiali (Azienda per L'Assistenza Sanitaria N. 5 'Friuli Occidentale', Pordenone), Roberto Cautiero (Second University Of Naples), Tommaso Bocchetti, (Sant'Andrea Hospital, Sapienza University of Rome), Elena Muzio, (S. Andrea Hospital, Poll-Asl 5, La Spezia); Vania Guglielmo (Policlinico Umberto I, Emergency Surgery Department); Eugenio Morandi (Ospedale di Rho – ASST Rhodense), Patrizio Mao (San Luigi Gonzaga Hospital, Orbassano); Emilia De Luca (Department of Medical and Surgical Sciences, Policlinico Universitario Mater Domini Campus Salvatore Venuta, Catanzaro), Margherita Notarnicola (Azienda Ospedaliero Universitaria Consorziale Policlinico Di Bari). **Jordan**: Farah Mahmoud Ali (Jordan University Hospital); **Lithuania**: Justas Žilinskas (Klaipeda Republic), Kestutis Strupas (Vilnius University Hospital), Paulius Kondrotas (Taurage County Hospital), Robertas Baltrunas (Rokiskis District Municipality Hospital); Juozas Kutkevicius (Department Of General Surgery, Lithuanian University Of Health Sciences), Povilas Ignatavicius (Hospital Of Lithuanian University Of Health Sciences Kaunas Clinics); **Malaysia**: Choy Ling Tan (Hospital Sultanah Aminah), Jia Yng Siaw (Hospital Sibu), Sir Young Yam (Penang Medical College); Ling Wilson (Sarawak General Hospital), Mohamed Rezal Abdul Aziz (University Malaya Medical Centre); **Malta**: John Bondin (Mater Dei Hospital); **Mexico**: Carmina Diaz Zorrilla (Hospital Espanol De Veracruz); **Morocco**: Anass Majbar (Centre Hospitalier Ibn Sina Rabat); **Nigeria**: Danjuma Sale (Barau Dikko Teaching Hospital), Lawal Abdullahi (Aminu KanoTeaching Hospital), Olabisi Osagie (University Of Abuja Teaching Hospital), Omolara Faboya (Lagos State Teaching Hospital); Adedeji Fatuga (Lagos University Teaching Hospital), Agboola Taiwo (Babcock University Teaching Hospital), Emeka Nwabuoku (Ahmadu Bello University Teaching Hospital); **Norway**: Marte Bliksøen (Oslo University Hospital); **Pakistan**: Zain Ali Khan (Bahawal Victoria Hospital, Bahawalpur); **Paraguay**: Jazmin Coronel (Hospital de Clínicas, II Cátedra de Clínica Quirúrgica, Universidad Nacional de Asunción); **Peru**: Cesar Miranda (Hospital Nacional Cayetano Heredia), Idelso Vasquez (Lima Almenara), Luis M. Helguero-Santin (Hospital Regional III Jose Cayetano Heredia – Piura); **Rwanda**: Jennifer Rickard (Centre Hospitalier Universitaire De Kigali); **Romania**: Aurel Mironescu (Spitalul Clinic De Copii Brasov); **Saint Kitts and Nevis**: Adesina Adedeji (Joseph N France Hospital); **Saudi Arabia**: Saleh Alqahtani (King Fahad General Hospital); **South Africa**: Max Rath (Groote Schuur Hospital), Michael Van Niekerk (New Somerset Hospital), Modise Zacharia Koto (Dr George Mukhari Academic Hospital); Roel Matos-Puig (Stanger Hospital); **Sweden**: Leif Israelsson (Sundsvall); **Switzerland**: Tobias Schuetz (Kantonsspital Olten); **Turkey**: Mahmut Arif Yuksek (Ondokuz Mayis University), Meric Mericliler (Acibadem University School of Medicine, Atakent Hospital), Mehmet Uluşahin (Karadeniz Technical University Farabi Hospital); **United Kingdom**: Bernhard Wolf (Raigmore Hospital Inverness), Cameron Fairfield (Royal Infirmary Of Edinburgh), Guo Liang Yong (Perth Royal Infirmary), Katharine Whitehurst (Royal Devon And Exeter), Michael Wilson (Ninewells Hospital And Medical School), Natalie Redgrave (John Radcliffe Hospital, Oxford); Caroluce K Musyoka (Royal Alexandra Hospital), James Olivier (Royal United Hospital Bath), Kathryn Lee (Queen Elizabeth Birmingham), Michael Cox (Royal Derby Hospital), Muhamed M H Farhan-Alanie (Inverclyde Royal Hospital), Rory Callan (North Middlesex University Hospital); **Zambia**: Chali Chibuye (Ndola Central Hospital)

GlobalSurg-2 Protocol translators: **Arabic,** Tebian Hassanein Ahmed Ali, Syrine Rekhis, Muna Rommaneh, Oday Halhouli**; Chinese,** Zi Hao Sam, Jacky Hong Chieh Chen**; French,** Dylan Roi, Lawani Ismaïl**; Greek,** Vasileios Kalles**; Italian,** Francesco Pata, Gabriela Elisa Nita, Federico Coccolini, Luca Ansaloni**; Portuguese,** Thays Brunelli Pugliesi, Gabriel Pardo**; Spanish,** Ruth Blanco, Eugenio Grasset Escobar.

