

THE LANCET

Global Health

Supplementary appendix

This appendix formed part of the original submission and has been peer reviewed. We post it as supplied by the authors.

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Supplementary material

Table of Contents

Appendix 1. Hospital-level survey and definitions.....	1
Appendix 2. Proportion of hospitals performing elective operations for each cancer by income group	6
Appendix 3. Proportion of hospitals performing elective operations for each cancer stratified by included cancers in GlobalSurg 3	6
Appendix 4. Relationship between hospital facilities and country income group	7
Appendix 5. Distribution of outcomes across number of available hospital facilities	8
Appendix 6A. Case volume stratified by hospital inclusion	9
Appendix 6B. Adjusted mortality rates stratified by hospital inclusion	10
Appendix 7. Hospital facility selection using backward elimination and AIC	11
Appendix 8. Hospital facility selection sensitivity analysis.....	12
Appendix 9. Patient characteristics by hospital facility level	13
Appendix 10. Relationship between hospital facility level and postoperative complication rates.....	15
Appendix 11A. Relationship between hospital facility level and patient safety / quality of cancer care metrics	16
Appendix 11B. Relationship between hospital facility level and patient safety / quality of cancer care metrics	17
Appendix 12. Proportion of hospitals performing elective operations for each cancer across hospital facility level.....	18
Appendix 13. Adjusted mortality rate across hospital facility level	19
Appendix 14. Adjusted mortality rate for colorectal and gastric cancer across hospital facility level.....	20
Appendix 15. Adjusted major complication rates across hospital facility level	21
Appendix 16. Sensitivity analysis using imputed dataset	22
Appendix 17. Sensitivity analysis - adjusted outcome rates across all eleven hospital facilities.....	24
Appendix 18. Adjusted major complication rates across hospital facility level	24
Appendix 19. Capacity to rescue patients following major complication following case-mix adjustment	25
Appendix 20. Absolute risk for 30-day mortality associated with four or more hospital facilities within each income group stratified by cancer type and sex	26
Appendix 21. Absolute risk for 30-day mortality in hospitals with more than three facilities within each income group stratified by cancer type and sex	27
Appendix 22. Absolute risk for 30-day mortality in hospitals with more than three facilities within each income group stratified by cancer type and sex	28
Appendix 19. Absolute risk for 30-day mortality associated with four or more hospital facilities within each income group stratified by cancer type and sex for higher risk surgical patients (ASA grade ≥ 3).....	30
Appendix 20. Absolute risk for 30-day mortality associated with four or more hospital facilities within each income group stratified by cancer type and sex for higher risk surgical patients (ASA grade ≥ 3).....	31
Authorship	32
Data Validators	44

Appendix 1. Hospital-level survey and definitions

Hospital characteristics

1. Please select your hospital (dropdown list)
2. What is the approximate size of population for which your hospital provides cancer care for?
<50,000 | 50,000-199,999 | 200,000-499,999 | 500,000-999,999 | 1,000,000-1,999,999 | 2,000,000+
How certain are you of this figure: Total guess | Uncertain | Reasonably sure | Certain
3. What type of hospital is your centre? *Please select the most appropriate description*
 - Non-referral hospital
Receive referrals only from community clinics and general practitioners
 - Referral hospital
Receive referrals from other trained surgeons, as well as from community clinics and general practitioners
 - Specialist cancer hospital
A hospital which solely treats patients with cancer

Diagnosis

For the following questions please answer for the last six months for patients undergoing surgery for cancer

4. If I want to request an ultrasound for my patient, either free or by payment, it is usually:
 - Not available at all
 - On site and always available
 - On site but not working / available all the time
 - Available at another hospital (patients are transferred)
 - No
5. If I want to request a computed tomography scan during standard working hours (0800 to 1700), either free or by payment, it is usually:
 - Not available at all
 - On site and always available
 - On site but not working / available all the time
 - Available at another hospital (patients are transferred)
6. If I want to request pathology services, either free or by payment, for cancer biopsies or resected specimens it is usually:
(please *select the most commonly encountered situation*)
 - Not available
 - On site and always available
 - On site but only available intermittently
 - Available at another hospital
 - Available in another country
7. Branching logic: If pathology for a cancer specimen is requested on a routine (non-urgent) basis, on average, how long on average does it take for this result to be available (in weeks)?
8. Branching logic: In the last six months, what proportion of patients received a pathology result following their cancer resection (for all cancers treated at your hospital)?
Slider: 0 – 100
How certain are you of this figure: Total guess | Uncertain | Reasonably sure | Certain

Patient journey

9. Do you have a Multidisciplinary Team (MDT) meeting to discuss treatment options for patients with breast, gastric and/or colorectal cancer at your site or another hospital?

Definition of MDT: Meeting of a group of professionals from two or more clinical disciplines who together make decisions regarding cancer treatment or care of individual patients¹

- No
- Yes – only for some cancers at my hospital
- Yes – for all cancers (breast, colorectal & gastric)

10. Branching logic: For the last 10 patients with breast, gastric and/or colorectal cancer who received elective (non-emergency) surgery, how many were discussed in the multi-disciplinary team (MDT) meeting?

None | 1-2 | 3-4 | 5-7 | 8-9 | All 10 patients

These were: Breast cancer only | GI cancer only | Breast and GI cancer (if only some cancers)

11. Branching logic: Please select the appropriate response for each professional

Not available | Available in hospital but attends <75% MDTs | Available in hospital and attends >75% MDTs

- Oncologist (including radiotherapy / chemotherapy specialists or both)
- Radiologist
- Pathologist
- Specialist cancer nurse / clinical nurse specialist
- Palliative care specialist
- Surgeon

Oncologist definition: Healthcare professional trained in and provides medical treatment for cancer (radiotherapy, chemotherapy, hormone therapy)²

Specialist cancer nurse definition: A registered nurse with additional education/training, skill and specialisation in cancer care^{3,4}

Palliative care specialist definition: a person who organises care and aims to improve quality of life of patients and their families facing the problem of a life-threatening illness⁵

12. Branching logic (if no MDT is present): Is there an oncologist at your hospital? (*select the most appropriate response for your hospital*)

Oncologist definition: Healthcare professional (or surgeon) trained in and provides medical treatment for cancer (radiotherapy, chemotherapy, hormone therapy)¹

- No
- Yes – a clinician who provides cancer care as well as care of non-cancer conditions
- Yes – a clinician who only provides cancer care

13. Branching logic (if no MDT is present): Do you have a trained doctor or healthcare professional in palliative medicine?

Defined as a Person who organises care and aims to improve quality of life of patients and their families facing the problem of a life-threatening illness.³ This includes

- No
- Yes

Oncology treatment

For the following questions please answer for the last six months for cancers surgically treated at your hospital (unless otherwise specified)

14. Is radiotherapy usually available for your patients (either free or by payment)?

- No
- Yes - at the same hospital
- Yes - at another hospital (within 10 km)
- Yes - at another hospital (10 - 50 km)
- Yes - at another hospital (> 50 km away)
- Yes - in another country

Distance measured using road network and shortest distance (not straight line distance)

15. Branching logic: What type of radiotherapy machine is available?

- Cobalt accelerator
- Linear accelerator

16. Are chemotherapy drugs usually available for your patients (either free or by payment)?

- No
- Yes - at the same hospital
- Yes - at another hospital (within 10 km)
- Yes – at another hospital (10 - 50 km)
- Yes – at another hospital (>50 km away)
- Yes - in another country

17. Do patients at your hospital make out of pocket (cash) payments for their surgical care (i.e. their surgery, postoperative care, medications, consumables)? (*Please select the most appropriate*)

- No patients make out of pocket payments
- Yes - patients who do not have insurance make out of pocket payments for at least some part of their care

- Yes - those patients that are able to afford to do so are asked to make out of pocket payments for at least some part of their care
- Yes - all patients make out of pocket payments for at least some part of their care

18. Do you have a designated area for post-operative care at your hospital?

*Post-operative care area: Defined as continuous patient monitoring of vital signs, including the use of a pulse oximeter, immediately after surgery by a designated carer for immediate intervention if required*⁶

- No
- Yes - sometimes
- Yes - all of the time

19. What is the highest level of bed available for patients receiving cancer surgery at your hospital (if required)?

- Post-operative ward bed only
- Specialist ward(s) providing intensive treatment and monitoring (HDU / ITU)

20. Do your patients have access to opiate pain medication within the first 24 hours of admission and following surgery?

*Opiate analgesia defined as Pethidine, Fentanyl or Morphine*⁴

- No
- Yes – but not always available
- Yes – available all of the time

Surgical management

21. For the following operations for cancer, have you performed any of these in the past three months?

For each cancer: No | This cancer is referred to another hospital routinely | Yes, as an emergency only | Yes, as a planned elective procedure (with or without emergency procedures)

- Breast: wide local excision / mastectomy
- Oesophageal cancer (including oesophogastric junctional tumours): oesophagectomy
- Lung: lobectomy / pneumonectomy / laryngectomy
- Stomach (including GISTs): total/partial gastrectomy / gastrojejunostomy
- Colon (excluding rectum): colonic resection
- Rectum: anterior resection / abdomino-peroneal excision
- Liver: hepatectomy
- Pancreas: pancreatectomy (all types)
- Kidney: nephrectomy
- Bladder cancer: cystectomy
- Prostate: prostatectomy
- Cervical and uterine cancer: hysterectomy / trachelectomy
- Ovarian: oophrectomy
- Thyroid: hemi-thyroidectomy / total thyroidectomy
- Lip and oral cavity: wide local excision / Mohs micrographic surgery / glossectomy
- Malignant melanoma: surgical excision

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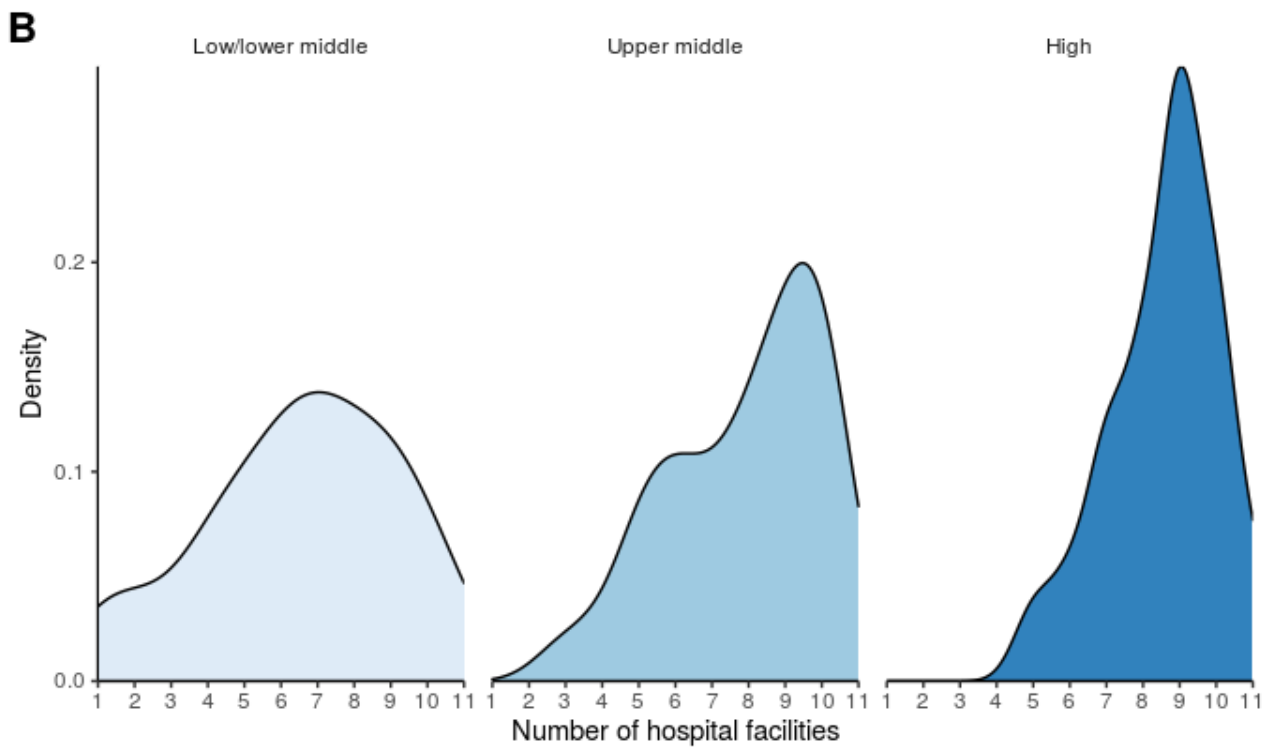
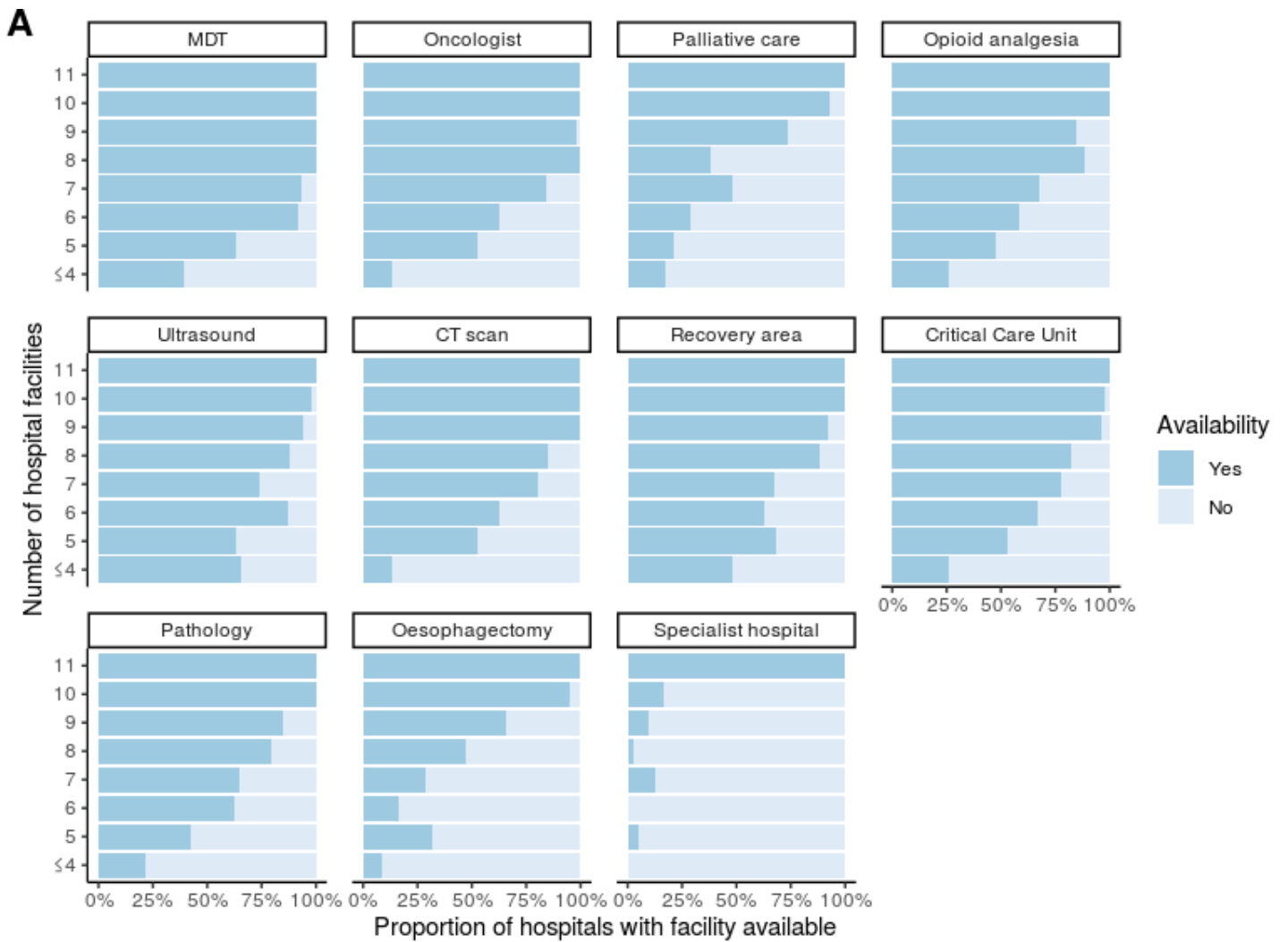
Appendix 2. Proportion of hospitals performing elective operations for each cancer by income group

Operation	High (n = 91)	Upper middle (n = 57)	Low/lower middle (n = 90)	p
Breast	75 (82.4)	50 (87.7)	84 (93.3)	0.080
Oesophagus	44 (48.4)	34 (59.6)	46 (51.1)	0.397
Lung	42 (46.2)	30 (52.6)	38 (42.2)	0.467
Gastric	76 (83.5)	53 (93.0)	73 (81.1)	0.132
Liver	50 (54.9)	42 (73.7)	35 (38.9)	<0.001
Pancreas	52 (57.1)	44 (77.2)	42 (46.7)	0.001
Renal	72 (79.1)	44 (77.2)	66 (73.3)	0.649
Colorectal	87 (95.6)	56 (98.2)	85 (94.4)	0.531
Rectum	83 (91.2)	53 (93.0)	73 (81.1)	0.045
Cervical	72 (79.1)	44 (77.2)	64 (71.1)	0.433
Ovarian	71 (78.0)	49 (86.0)	65 (72.2)	0.148

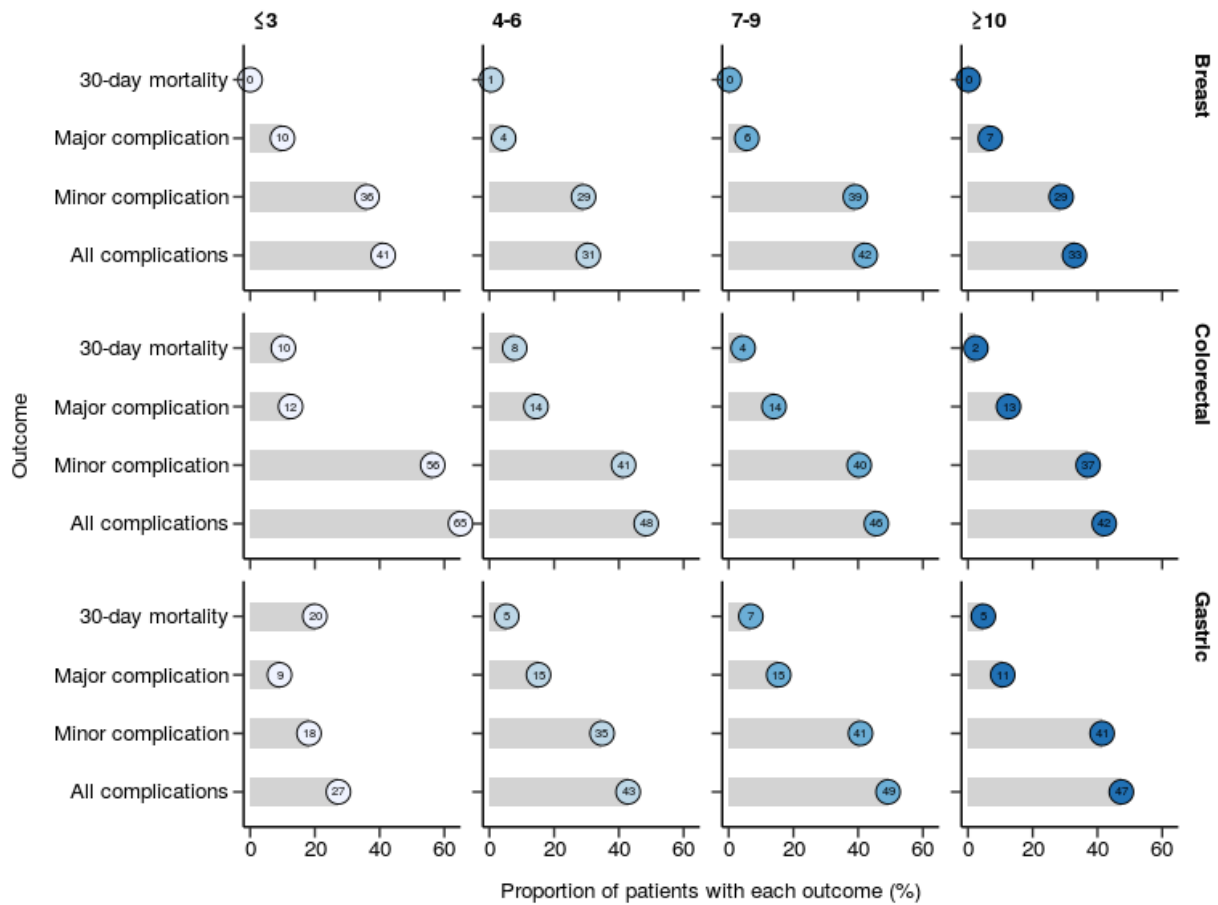
Appendix 3. Proportion of hospitals performing elective operations for each cancer stratified by included cancers in GlobalSurg 3

Operation	All hospitals			p	LMIC hospitals			p
	Breast only (n = 29)	Colorectal and gastric (n = 21)	All cancers (n = 180)		Breast only (n = 17)	Colorectal and gastric (n = 8)	All cancers (n = 117)	
Oesophagus	0 (0.0)	8 (38.1)	115 (63.9)	<0.001	0 (0.0)	2 (25.0)	77 (65.8)	<0.001
Lung	1 (3.4)	6 (28.6)	102 (56.7)	<0.001	0 (0.0)	3 (37.5)	65 (55.6)	<0.001
Liver	1 (3.4)	11 (52.4)	114 (63.3)	<0.001	1 (5.9)	5 (62.5)	70 (59.8)	<0.001
Pancreas	1 (3.4)	12 (57.1)	125 (69.4)	<0.001	1 (5.9)	6 (75.0)	79 (67.5)	<0.001
Renal	14 (48.3)	17 (81.0)	151 (83.9)	<0.001	10 (58.8)	7 (87.5)	93 (79.5)	0.127
Rectum	18 (62.1)	19 (90.5)	170 (94.4)	<0.001	9 (52.9)	7 (87.5)	108 (92.3)	<0.001
Cervical	18 (62.1)	12 (57.1)	149 (82.8)	0.003	13 (76.5)	5 (62.5)	89 (76.1)	0.685
Ovarian	19 (65.5)	12 (57.1)	153 (85.0)	0.001	13 (76.5)	5 (62.5)	95 (81.2)	0.422

Appendix 4. Relationship between hospital facilities and country income group



Appendix 5. Distribution of outcomes across number of available hospital facilities



Minor complication - Clavien-Dindo grade I or II; Major complication - Clavien-Dindo grade III or IV; All complications – Clavien-Dindo grade I-V

Appendix 6A. Case volume stratified by hospital inclusion

Case volumes were calculated as the median number of patients recruited across each hospital during a 28-day data collection period

Hospital-level data available				
Cancer type	WB tertile	Yes	No	P value
Breast	High	9.0 (4.0 to 19.8)	10.0 (5.0 to 18.0)	0.655
	Upper middle	5.0 (2.0 to 8.5)	2.0 (1.5 to 5.5)	0.182
	Low/lower middle	3.0 (1.0 to 6.0)	2.0 (2.0 to 3.0)	0.358
Colorectal	High	6.0 (4.0 to 11.0)	8.0 (5.0 to 12.0)	0.095
	Upper middle	4.0 (2.0 to 7.0)	2.0 (1.0 to 3.5)	0.052
	Low/lower middle	2.0 (1.0 to 4.8)	2.0 (1.0 to 4.0)	0.524
Gastric	High	2.0 (1.0 to 3.0)	2.0 (1.0 to 3.0)	0.884
	Upper middle	2.0 (1.0 to 3.0)	1.5 (1.0 to 3.5)	0.755
	Low/lower middle	1.0 (1.0 to 2.0)	1.0 (1.0 to 2.0)	0.980

Appendix 6B. Adjusted mortality rates stratified by hospital inclusion

Adjusted mortality rates were calculated using generalised estimating equations (GEE) to account for potential confounders (WB tertile, age, sex, cancer type, ECOG performance status, ASA grade, disease stage, and operative urgency). Confidence intervals (CIs) and a P value for trend were fitted using the multilevel logistic regression model with all confounders as covariates

WB tertile	Hospital-level data available	Hospital number	Patient number	Adjusted mortality (95% CI)	Odds ratio	P value
High	Yes	90	3202	1.4 (1.3 to 1.5)	Ref	
	No	150	5038	1.4 (1.3 to 1.5)	0.98 (0.67 to 1.42)	0.92
Upper middle	Yes	57	2011	2.2 (2 to 2.4)	Ref	
	No	24	563	2.2 (1.8 to 2.6)	0.97 (0.51 to 1.86)	1.00
Low/lower middle	Yes	91	3655	2.5 (2.3 to 2.7)	Ref	
	No	16	186	4.3 (3.3 to 5.4)	1.76 (0.84 to 3.68)	0.15

Appendix 7. Hospital facility selection using backward elimination and AIC

Hospital facility	Coefficient	Standard error	Z value	P value	Final model
Intercept	-1.79387	0.37231	-4.818	<0.001	-
MDT	0.16836	0.44184	0.381	0.7032	-
Oncologist	-0.30738	0.13607	-2.259	0.0239	Included
Palliative care	0.06800	0.17714	0.384	0.7011	-
Opioid analgesia	-0.53143	0.20977	-2.533	0.0113	Included
Ultrasound	-0.49329	0.24598	-2.005	0.0449	Included
CT scan	-0.70332	0.23303	-3.018	0.0025	Included
Recovery area	-0.30676	0.20158	-1.522	0.1281	-
Critical Care unit	-0.30738	0.13607	-2.259	0.0239	Included
Pathology	0.01728	0.25915	0.067	0.9468	-
Hospital type	-0.57405	0.30024	-1.912	0.0559	-
Oesophagectomy	-0.11290	0.16960	-0.666	0.5056	-

Appendix 8. Hospital facility selection sensitivity analysis

Performed using bootstrap procedure (n=5000)

Hospital facility	Selected (%)	Deviance	Residual degrees of freedom	Residual deviation	AIC	Final model
CT scan	91.65	-	-	-	-	Included
Opioid analgesia	84.80	-	-	-	-	Included
Ultrasound	83.35	-	-	-	-	Included
Oncologist	71.80	-	-	-	-	Included
Critical Care unit	69.90	-	-	-	-	Included
Hospital type	38.35	0.001	9555	1843.525	1869.525	-
Recovery area	33.90	0.004	9556	1843.53	1867.530	-
Oesophagectomy	29.70	0.551	9560	1844.437	1860.437	-
Palliative care	26.60	0.145	9558	1843.679	1863.679	-
MDT	24.30	0.207	9559	1843.886	1861.886	-
Pathology	22.65	0.004	9557	1843.534	1865.534	-

Appendix 9. Patient characteristics by hospital facility level

Numbers are n (%) or mean (SD). High income included 20 countries and 91 hospitals. Upper-middle income included 19 countries and 57 hospitals. Lower-middle income or low income included 27 countries and 90 hospitals. The total column therefore includes 66 countries and 238 hospitals. ASA=American Society of Anesthesiologists. ECOG=Eastern Cooperative Oncology Group.

Hospital facility level	5 (n = 6378)	4 (n = 2013)	≤3 (n = 1294)	Total (n = 9685)	p
Distribution of patients across WB income (tertile)					
High	2669 (41.8)	867 (43.1)	100 (7.7)	3636 (37.5)	<0.001
Upper middle	1375 (21.6)	251 (12.5)	493 (38.1)	2119 (21.9)	
Low/lower middle	2334 (36.6)	895 (44.5)	701 (54.2)	3930 (40.6)	
Cancer type					
Breast	3834 (60.1)	1192 (59.2)	625 (48.3)	5651 (58.3)	<0.001
Colorectal (colon or rectum)	2010 (31.5)	654 (32.5)	534 (41.3)	3198 (33.0)	
Gastric (stomach)	534 (8.4)	167 (8.3)	135 (10.4)	836 (8.6)	
Age (years)	57.9 (14.4)	58.5 (14.2)	56.2 (13.8)	57.8 (14.3)	<0.001
Sex (%)					
Male	1489 (23.3)	465 (23.1)	379 (29.3)	2333 (24.1)	<0.001
Female	4886 (76.6)	1546 (76.8)	914 (70.6)	7346 (75.8)	
(Missing)	3 (0.0)	2 (0.1)	1 (0.1)	6 (0.1)	
ECOG performance status					
0	3668 (57.5)	1007 (50.0)	612 (47.3)	5287 (54.6)	<0.001
1	1520 (23.8)	519 (25.8)	356 (27.5)	2395 (24.7)	
2	750 (11.8)	226 (11.2)	157 (12.1)	1133 (11.7)	
3/4	198 (3.1)	94 (4.7)	115 (8.9)	407 (4.2)	
(Missing)	242 (3.8)	167 (8.3)	54 (4.2)	463 (4.8)	
ASA					
I	1385 (21.7)	387 (19.2)	382 (29.5)	2154 (22.2)	<0.001
II	3469 (54.4)	1099 (54.6)	668 (51.6)	5236 (54.1)	
III	1191 (18.7)	359 (17.8)	148 (11.4)	1698 (17.5)	
IV	89 (1.4)	32 (1.6)	22 (1.7)	143 (1.5)	
V	6 (0.1)	11 (0.5)	3 (0.2)	20 (0.2)	
(Missing)	238 (3.7)	125 (6.2)	71 (5.5)	434 (4.5)	
Stage					
0	192 (3.0)	51 (2.5)	11 (0.9)	254 (2.6)	<0.001
I	2631 (41.3)	812 (40.3)	334 (25.8)	3777 (39.0)	
II	593 (9.3)	216 (10.7)	146 (11.3)	955 (9.9)	
III	2456 (38.5)	777 (38.6)	608 (47.0)	3841 (39.7)	
IV	453 (7.1)	146 (7.3)	179 (13.8)	778 (8.0)	
(Missing)	53 (0.8)	11 (0.5)	16 (1.2)	80 (0.8)	
Urgency					
Elective	6081 (95.3)	1850 (91.9)	1180 (91.2)	9111 (94.1)	<0.001

	Emergency	295 (4.6)	161 (8.0)	114 (8.8)	570 (5.9)	
	(Missing)	2 (0.0)	2 (0.1)	0 (0.0)	4 (0.0)	
30-day mortality						
	Alive	6210 (97.4)	1947 (96.7)	1216 (94.0)	9373 (96.8)	<0.001
	Dead	97 (1.5)	42 (2.1)	56 (4.3)	195 (2.0)	
	(Missing)	71 (1.1)	24 (1.2)	22 (1.7)	117 (1.2)	
Major complication						
	Yes	603 (9.5)	192 (9.5)	143 (11.1)	938 (9.7)	0.178
	No	5744 (90.1)	1800 (89.4)	1136 (87.8)	8680 (89.6)	
	(Missing)	31 (0.5)	21 (1.0)	15 (1.2)	67 (0.7)	

Appendix 10. Relationship between hospital facility level and postoperative complication rates

Hospital facility level			5 (n = 3834)	4 (n = 1192)	≤3 (n = 625)	p
Breast	Surgical site infection	No	387 (10.1)	125 (10.5)	100 (16.0)	<0.001
	Postoperative haemorrhage	Yes	118 (3.1)	40 (3.4)	20 (3.2)	0.864
	Seroma	No	738 (19.2)	231 (19.4)	147 (23.5)	0.030

Hospital facility count		5 (n = 2544)	4 (n = 821)	≤3 (n = 669)	p
Colorectal and gastric	Surgical site infection	384 (15.1)	115 (14.0)	189 (28.3)	<0.001
	Intra-abdominal abscess	125 (4.9)	44 (5.4)	34 (5.1)	0.835
	Anastomotic leak	125 (4.9)	49 (6.0)	40 (6.0)	0.303
	Postoperative haemorrhage	105 (4.1)	39 (4.8)	28 (4.2)	0.730

Appendix 11A. Relationship between hospital facility level and patient safety / quality of cancer care metrics

Hospital facility level		>3 (n = 8391)	≤3 (n = 1294)	p
Surgical safety checklist used		6872 (83.7)	910 (73.6)	<0.001
Anastomosis performed		2553 (77.5)	467 (72.9)	0.013
Negative margin		7015 (90.8)	948 (87.5)	0.001
Length of stay (days)		3.0 (1.0 to 7.0)	5.0 (3.0 to 9.0)	<0.001
Readmission		397 (4.8)	68 (5.4)	0.404
Method of follow-up at 30 days	Still inpatient or readmitted	250 (3.0)	79 (6.2)	<0.001
	Clinic review	6273 (75.9)	584 (45.6)	
	Telephone review	1414 (17.1)	578 (45.2)	
	Community/home review	27 (0.3)	1 (0.1)	
	Discharged before 30 days and not contacted again	298 (3.6)	38 (3.0)	
Radiotherapy available		6620 (78.9)	588 (45.4)	<0.001
Chemotherapy available		7808 (93.1)	958 (74.0)	<0.001
Multidisciplinary tumour board available for all cancers treated in hospital		6568 (78.3)	405 (31.3)	<0.001

Appendix 11B. Relationship between hospital facility level and patient safety / quality of cancer care metrics

	5 (n = 6378)	4 (n = 2013)	≤3 (n = 1294)	p	
Surgical safety checklist used	5160 (83.1)	1712 (85.4)	910 (73.6)	<0.001	
Anastomosis performed	1949 (77.9)	604 (76.2)	467 (72.9)	0.024	
Negative margin	5403 (90.9)	1612 (90.7)	948 (87.5)	0.002	
Length of stay (days)	3.0 (1.0 to 7.0)	3.0 (1.0 to 7.0)	5.0 (3.0 to 9.0)	<0.001	
Readmission	309 (4.9)	88 (4.5)	68 (5.4)	0.490	
Method of follow-up at 30 days	Still inpatient or readmitted	168 (2.7)	82 (4.1)	79 (6.2)	<0.001
	Clinic review	4978 (79.4)	1295 (64.9)	584 (45.6)	
	Telephone review	882 (14.1)	532 (26.7)	578 (45.2)	
	Community/home review	21 (0.3)	6 (0.3)	1 (0.1)	
	Discharged before 30 days and not contacted again	219 (3.5)	79 (4.0)	38 (3.0)	
Radiotherapy available	5280 (82.8)	1340 (66.6)	588 (45.4)	<0.001	
Chemotherapy available	6091 (95.5)	1717 (85.3)	958 (74.0)	<0.001	
Multidisciplinary tumour board available for all cancers treated in hospital	5269 (82.6)	1299 (64.5)	405 (31.3)	<0.001	

Numbers are n (%) or median (IQR). Negative resection margins were defined according to National Institute for Clinical Excellence Guidance and guidelines. MDT – multidisciplinary team

Appendix 12. Proportion of hospitals performing elective operations for each cancer across hospital facility level

Operation	5 (n = 113)	4 (n = 63)	≤3 (n = 62)	p
Breast	101 (89.4)	53 (84.1)	55 (88.7)	0.575
Oesophagus	76 (67.3)	28 (44.4)	20 (32.3)	<0.001
Lung	73 (64.6)	24 (38.1)	13 (21.0)	<0.001
Gastric	104 (92.0)	52 (82.5)	46 (74.2)	0.006
Liver	80 (70.8)	30 (47.6)	17 (27.4)	<0.001
Pancreas	86 (76.1)	30 (47.6)	22 (35.5)	<0.001
Renal	98 (86.7)	43 (68.3)	41 (66.1)	0.002
Colorectal	111 (98.2)	59 (93.7)	58 (93.5)	0.206
Rectum	108 (95.6)	52 (82.5)	49 (79.0)	0.002
Cervical	93 (82.3)	44 (69.8)	43 (69.4)	0.074
Ovarian	97 (85.8)	44 (69.8)	44 (71.0)	0.017

Appendix 13. Adjusted mortality rate across hospital facility level

Adjusted mortality rates were calculated using generalised estimating equations (GEE) to account for clustering of patients in hospital and for potential confounders (WB tertile, age, sex, cancer type, ECOG performance status, ASA grade, disease stage, and operative urgency). Confidence intervals (CIs) and a P value for trend were fitted using the multilevel logistic regression model with the number of hospital facilities and all confounders as covariates

	Hospital facility level	Hospital number (%)	Number of Patients (%)	Adjusted mortality (95% CI)	Odds ratio	P value
All cancers	5	113 (47.7)	5912 (66.6)	1 (0.7 to 1.2)	Ref	
	4	63 (26.6)	1787 (20.2)	1.5 (0.9 to 2)	1.49 (0.94 to 2.37)	0.092
	≤3	61 (25.7)	1169 (13.2)	3.7 (2.6 to 4.8)	3.85 (2.58 to 5.75)	<0.001
Colorectal and gastric cancer	5	105 (48.0)	2388 (63.8)	4.1 (3.8 to 4.3)	Ref	
	4	57 (26.0)	753 (20.1)	5.2 (4.6 to 5.8)	1.29 (0.88 to 1.89)	0.22
	≤3	57 (26.0)	602 (16.1)	6.9 (6 to 7.8)	1.73 (1.18 to 2.52)	0.006

Appendix 14. Adjusted mortality rate for colorectal and gastric cancer across hospital facility level

	Hospital facility level	Patient n (%)	Adjusted mortality (95% CI)
Colorectal	5	1877 (63.3)	3.5 (3.3 to 3.8)
	4	610 (20.6)	3.9 (3.4 to 4.5)
	≤3	478 (16.1)	8.8 (7.6 to 9.9)
Gastric	5	511 (65.7)	4.9 (4.3 to 5.5)
	4	143 (18.4)	4.2 (3.1 to 5.3)
	≤3	124 (15.9)	11.3 (8.8 to 13.8)

Adjusted mortality rates were calculated using generalised estimating equations (GEE) to account for clustering of patients in hospital and for potential confounders (WB tertile, age, sex, cancer type, ECOG performance status, ASA grade, disease stage, and operative urgency). Confidence intervals (CIs) fitted using the multilevel logistic regression model with the number of hospital facilities and all confounders as covariates

Appendix 15. Adjusted major complication rates across hospital facility level

Adjusted major complication rates were calculated using generalised estimating equations (GEE) to account for clustering of patients in hospital and for potential confounders (WB tertile, age, sex, cancer type, ECOG performance status, ASA grade, disease stage, and operative urgency). Confidence intervals (CIs) and a P value for trend were fitted using the multilevel logistic regression model with the number of hospital facilities and all confounders as covariates

	Hospital facility level	Hospital number (%)	Number of Patients (%)	Adjusted major complication rate (95% CI)	Odds ratio	P value
All cancers	5	113 (47.5)	5951 (66.7)	9.3 (9.1 to 9.5)	Ref	
	4	63 (26.5)	1789 (20.1)	9.6 (9.2 to 9.9)	1.03 (0.86 to 1.23)	0.746
	≤3	62 (26.0)	1175 (13.2)	11.8 (11.2 to 12.3)	1.30 (1.06 to 1.58)	0.011
Colorectal and gastric cancer	5	105 (47.7)	2405 (63.8)	13.5 (13.2 to 13.8)	Ref	
	4	57 (26.0)	755 (20.1)	15.9 (15.2 to 16.6)	1.21 (0.97 to 1.52)	0.105
	≤3	58 (26.3)	608 (16.1)	18.0 (17.1 to 18.8)	1.40 (1.11 to 1.78)	0.007

Appendix 16. Sensitivity analysis using imputed dataset

Adjusted mortality rate

Adjusted mortality rates were calculated using generalised estimating equations (GEE) to account for clustering of patients in hospital and for potential confounders (WB tertile, age, sex, cancer type, ECOG performance status, ASA grade, disease stage, and operative urgency). Confidence intervals (CIs) and a P value for trend were fitted using the multilevel logistic regression model with the number of hospital facilities and all confounders as covariates

	Hospital facility level	Hospital number	Patient number	Adjusted mortality rate (95% CI)	Odds ratio	P value
All cancers	5	215	9617	1.5 (1.4 to 1.6)	Ref	
	4	140	3736	1.9 (1.8 to 2.1)	1.29 (0.97 to 1.72)	0.079
	≤3	72	1302	4.8 (4.2 to 5.3)	3.29 (2.43 to 4.46)	<0.001
Colorectal and gastric cancer	5	205	4407	3.0 (2.9 to 3.2)	Ref	
	4	127	1932	3.5 (3.2 to 3.8)	1.15 (0.86 to 1.56)	0.350
	≤3	66	670	9.1 (8 to 10.1)	3.22 (2.35 to 4.41)	<0.001

Major complication rates

Adjusted major complication rates were calculated using generalised estimating equations (GEE) to account for clustering of patients in hospital and for potential confounders (WB tertile, age, sex, cancer type, ECOG performance status, ASA grade, disease stage, and operative urgency). Confidence intervals (CIs) and a P value for trend were fitted using the multilevel logistic regression model with the number of hospital facilities and all confounders as covariates

	Hospital facility level	Hospital number	Patient number	Adjusted major complication rate (95% CI)	Odds ratio	P value
All cancers	5	215	9669	9.7 (9.6 to 9.8)	Ref	
	4	140	3742	10.0 (9.8 to 10.3)	1.04 (0.91 to 1.18)	0.560
	≤3	73	1311	11.5 (11.1 to 12.0)	1.21 (1.01 to 1.46)	0.043
Colorectal and gastric cancer	5	205	4434	13.7 (13.5 to 13.9)	Ref	
	4	127	1938	14.9 (14.5 to 15.3)	1.11 (0.95 to 1.29)	0.196
	≤3	67	676	17.8 (17 to 18.6)	1.38 (1.11 to 1.71)	0.005

Adjusted capacity to rescue rates

Adjusted mortality rates after major complication were calculated using generalised estimating equations (GEE) to account for clustering of patients in hospital and for potential confounders (WB tertile, age, sex, cancer type, ECOG performance status, ASA grade, disease stage, and operative urgency). Confidence intervals (CIs) and a P value for trend were fitted using the multilevel logistic regression model with the number of hospital facilities and all confounders as covariates

	Hospital facility level	Hospital number	Patient number	Adjusted capacity to rescue (95% CI)	Odds ratio	P value
All cancers	5	175	940	84.7 (83.6 to 85.9)	Ref	
	4	97	377	81.0 (78.9 to 83.0)	0.77 (0.56 to 1.05)	0.100
	≤3	49	148	57.9 (53.3 to 62.5)	0.25 (0.17 to 0.36)	<0.001
Colorectal and gastric cancer	5	156	599	78.0 (76.5 to 79.5)	Ref	
	4	93	289	76.9 (74.6 to 79.2)	0.94 (0.67 to 1.31)	0.730
	≤3	40	122	50.0 (45.5 to 54.5)	0.28 (0.19 to 0.42)	<0.001

Appendix 17. Sensitivity analysis - adjusted outcome rates across all eleven hospital facilities

All eleven hospital facilities were included within a sensitivity analysis, with hospitals categorised into different facility levels by patient distribution. Adjusted mortality rates were calculated using generalised estimating equations (GEE) to account for clustering of patients in hospital and for potential confounders (WB tertile, age, sex, cancer type, ECOG performance status, ASA grade, disease stage, and operative urgency). Confidence intervals (CIs) and a P value for trend were fitted using the multilevel logistic regression model with the number of hospital facilities and all confounders as covariates

	Hospital facility level	Hospital number	Patient number	Adjusted mortality (95% CI)	Odds ratio	P value
All cancers	10-11	54	4009	0.9 (0.6 to 1.2)	Ref	
	8-9	87	2665	1.2 (0.8 to 1.6)	1.3 (0.8 to 2.1)	0.320
	≤7	96	2194	2.7 (2.1 to 3.4)	3.1 (2.05 to 4.71)	<0.001
Colorectal and gastric cancer	10-11	50	1443	4 (3.7 to 4.3)	Ref	
	8-9	81	1325	4.3 (3.9 to 4.7)	1.07 (0.74 to 1.56)	0.775
	≤7	88	975	6.5 (5.8 to 7.1)	1.65 (1.14 to 2.38)	0.008

Appendix 18. Adjusted major complication rates across hospital facility level

Adjusted major complication rates were calculated using generalised estimating equations (GEE) to account for clustering of patients in hospital and for potential confounders (WB tertile, age, sex, cancer type, ECOG performance status, ASA grade, disease stage, and operative urgency). Confidence intervals (CIs) and a P value for trend were fitted using the multilevel logistic regression model with the number of hospital facilities and all confounders as covariates

	Hospital facility level	Hospital number	Patient number	Adjusted major complication rate (95% CI)	Odds ratio	P value
All cancers	10-11	54	4038	8.6 (8.4 to 8.8)	Ref	
	8-9	87	2676	10.3 (10.1 to 10.6)	1.23 (1.04 to 1.45)	0.014
	≤7	97	2201	10.8 (10.4 to 11.1)	1.29 (1.08 to 1.53)	0.005
Colorectal and gastric cancer	10-11	50	1452	13.8 (13.4 to 14.2)	Ref	
	8-9	81	1334	14.6 (14.2 to 15.1)	1.07 (0.87 to 1.33)	0.550
	≤7	89	982	16.4 (15.7 to 17.0)	1.23 (0.98 to 1.54)	0.081

Appendix 19. Capacity to rescue patients following major complication following case-mix adjustment

Adjusted mortality rates after major complication were calculated using generalised estimating equations (GEE) to account for clustering of patients in hospital and for potential confounders (WB tertile, age, sex, cancer type, ECOG performance status, ASA grade, disease stage, and operative urgency). Confidence intervals (CIs) and a P value for trend were fitted using the multilevel logistic regression model with the number of hospital facilities and all confounders as covariates

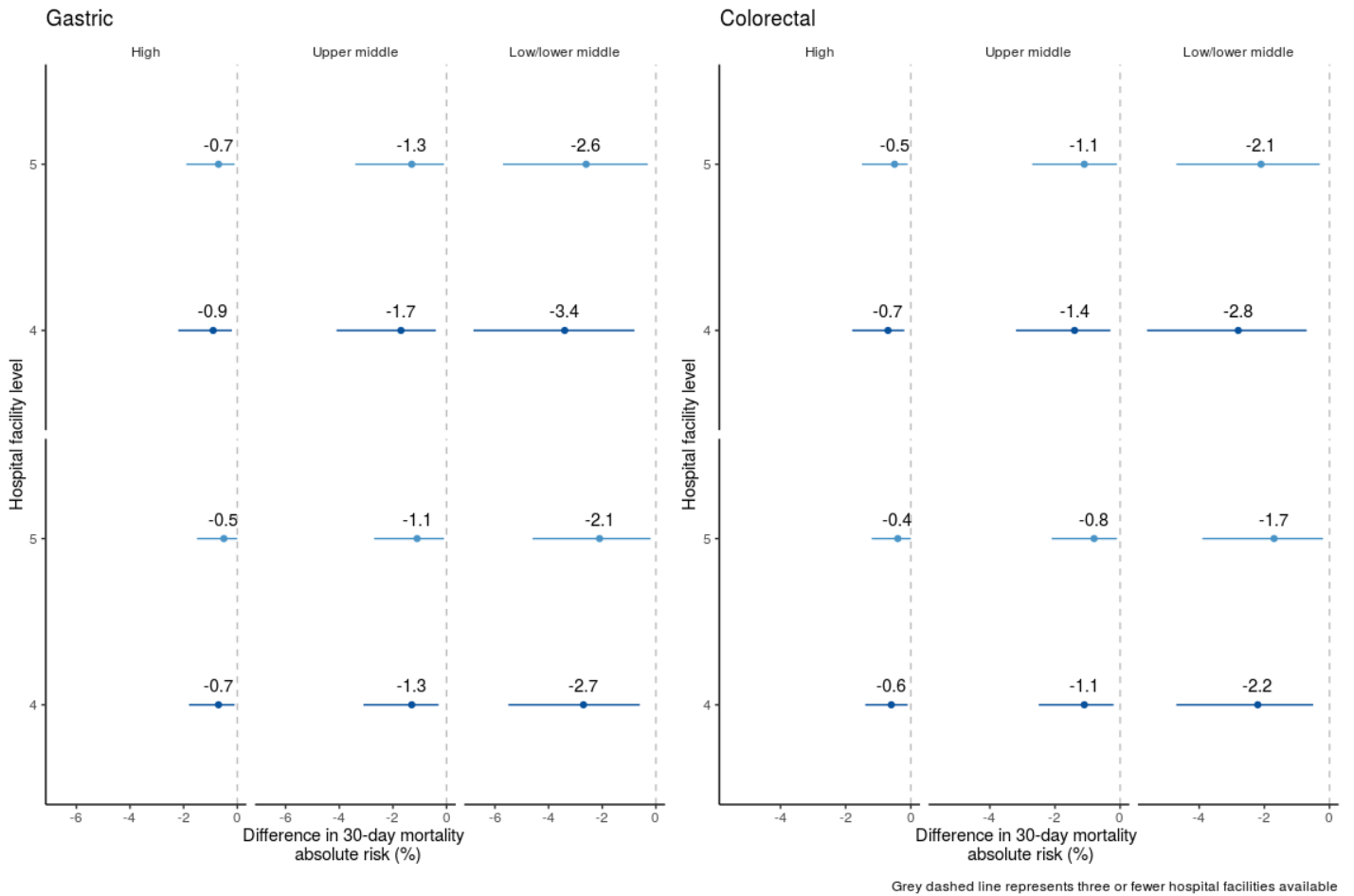
	Hospital facility level	Hospital number	Patient number	Adjusted capacity to rescue (95% CI)	Odds ratio	P value
All cancers	10-11	43	366	84.7 (81 to 88.4)	Ref	
	8-9	65	283	72.8 (67.6 to 78)	0.48 (0.33 to 0.71)	<0.001
	≤7	62	227	75.3 (69.7 to 81)	0.55 (0.36 to 0.84)	0.005
Colorectal and gastric cancer	10-11	34	189	71.5 (68.6 to 74.4)	Ref	
	8-9	61	195	71.2 (68.4 to 74)	0.99 (0.64 to 1.55)	1
	≤7	53	165	60.4 (56.6 to 64.2)	0.62 (0.39 to 0.96)	0.033

Appendix 20. Absolute risk for 30-day mortality associated with four or more hospital facilities within each income group stratified by cancer type and sex

Estimates for age 60 years, performance status 1, ASA grade 2, cancer stage III, and elective surgery.

Hospital facility level	WB income (tertile)	Cancer type	Sex	Age (years)	ECOG performance status	ASA	Stage	Urgency	Predicted probability of death	Absolute risk difference
>3	Low/lower middle	Colorectal	Male	60	1	II	III	Elective	0.036 (0.020 to 0.055)	-
≤3	Low/lower middle	Colorectal	Male	60	1	II	III	Elective	0.060 (0.034 to 0.095)	0.024 (0.005 to 0.051, p=0.011)
>3	Upper middle	Colorectal	Male	60	1	II	III	Elective	0.018 (0.009 to 0.029)	-
≤3	Upper middle	Colorectal	Male	60	1	II	III	Elective	0.031 (0.015 to 0.053)	0.012 (0.002 to 0.029, p=0.009)
>3	High	Colorectal	Male	60	1	II	III	Elective	0.009 (0.004 to 0.015)	-
≤3	High	Colorectal	Male	60	1	II	III	Elective	0.015 (0.007 to 0.028)	0.006 (0.001 to 0.015, p=0.010)
>3	Low/lower middle	Colorectal	Female	60	1	II	III	Elective	0.028 (0.016 to 0.044)	-
≤3	Low/lower middle	Colorectal	Female	60	1	II	III	Elective	0.048 (0.025 to 0.076)	0.019 (0.004 to 0.040, p=0.010)
>3	Upper middle	Colorectal	Female	60	1	II	III	Elective	0.014 (0.007 to 0.023)	-
≤3	Upper middle	Colorectal	Female	60	1	II	III	Elective	0.024 (0.011 to 0.042)	0.010 (0.002 to 0.023, p=0.011)
>3	High	Colorectal	Female	60	1	II	III	Elective	0.007 (0.003 to 0.012)	-
≤3	High	Colorectal	Female	60	1	II	III	Elective	0.012 (0.005 to 0.022)	0.005 (0.001 to 0.012, p=0.013)
>3	Low/lower middle	Gastric	Male	60	1	II	III	Elective	0.044 (0.024 to 0.070)	-
≤3	Low/lower middle	Gastric	Male	60	1	II	III	Elective	0.074 (0.041 to 0.117)	0.028 (0.006 to 0.060, p=0.009)
>3	Upper middle	Gastric	Male	60	1	II	III	Elective	0.022 (0.011 to 0.038)	-
≤3	Upper middle	Gastric	Male	60	1	II	III	Elective	0.038 (0.018 to 0.069)	0.015 (0.003 to 0.036, p=0.016)
>3	High	Gastric	Male	60	1	II	III	Elective	0.011 (0.005 to 0.020)	-
≤3	High	Gastric	Male	60	1	II	III	Elective	0.019 (0.008 to 0.037)	0.007 (0.001 to 0.020, p=0.014)
>3	Low/lower middle	Gastric	Female	60	1	II	III	Elective	0.035 (0.018 to 0.057)	-
≤3	Low/lower middle	Gastric	Female	60	1	II	III	Elective	0.059 (0.030 to 0.093)	0.023 (0.005 to 0.048, p=0.008)
>3	Upper middle	Gastric	Female	60	1	II	III	Elective	0.017 (0.008 to 0.030)	-
≤3	Upper middle	Gastric	Female	60	1	II	III	Elective	0.030 (0.014 to 0.053)	0.011 (0.002 to 0.028, p=0.015)
>3	High	Gastric	Female	60	1	II	III	Elective	0.009 (0.004 to 0.016)	-
≤3	High	Gastric	Female	60	1	II	III	Elective	0.015 (0.006 to 0.029)	0.006 (0.001 to 0.016, p=0.014)

Appendix 21. Absolute risk for 30-day mortality in hospitals with more than three facilities within each income group stratified by cancer type and sex



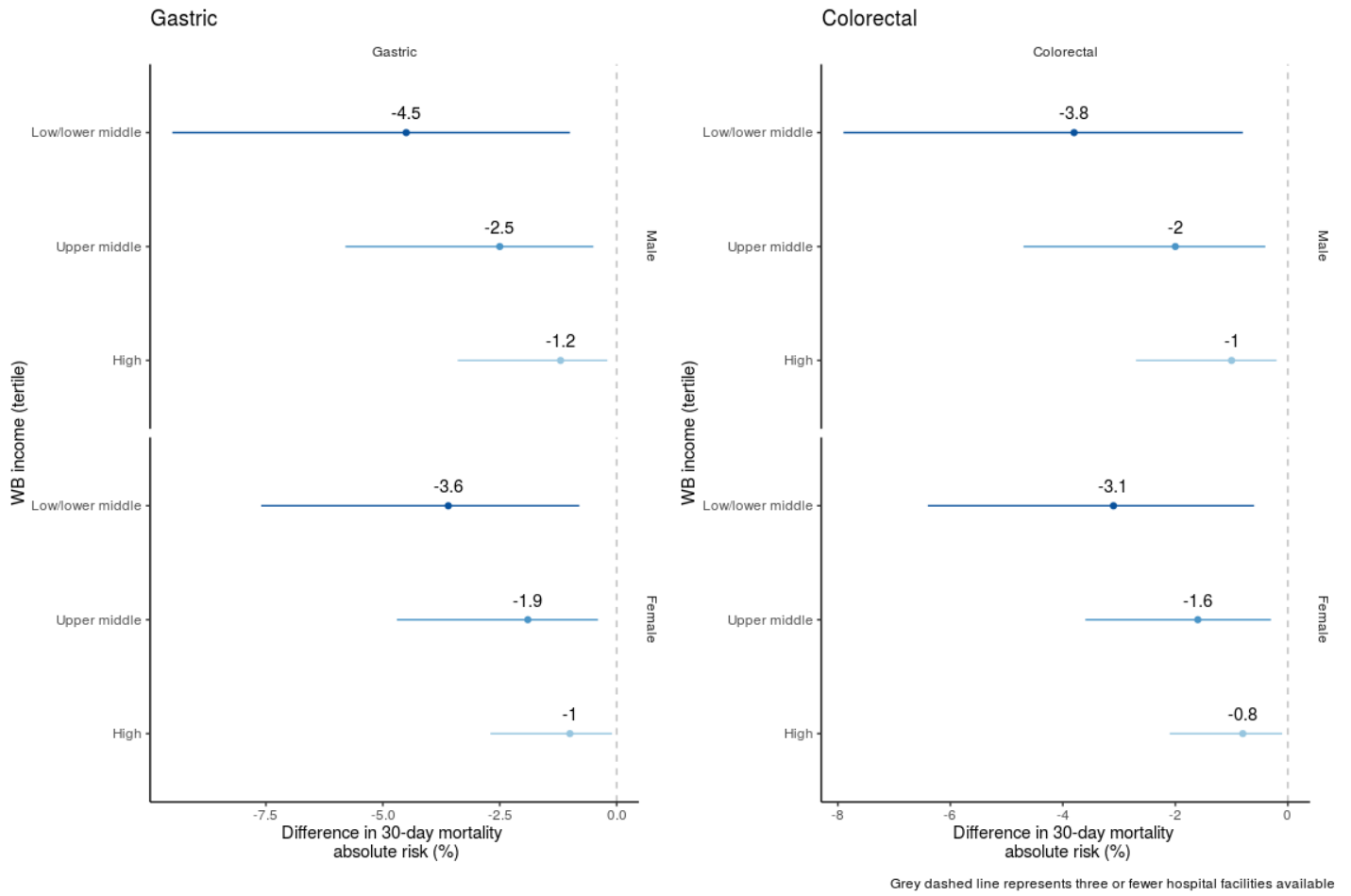
Estimates for age 60 years, performance status 1, ASA grade 2, cancer stage III, and elective surgery.

Appendix 22. Absolute risk for 30-day mortality in hospitals with more than three facilities within each income group stratified by cancer type and sex
 Estimates for age 60 years, performance status 1, ASA grade 2, cancer stage III, and elective surgery.

Hospital facility level	WB income (tertile)	Cancer type	Sex	Age (years)	ECOG performance status	ASA	Stage	Urgency	Predicted probability of death	Absolute risk difference
5	Low/lower middle	Colorectal	Male	60	1	II	III	Elective	0.037 (0.021 to 0.058)	-
4	Low/lower middle	Colorectal	Male	60	1	II	III	Elective	0.030 (0.015 to 0.052)	-0.007 (-0.022 to 0.009, p=0.368)
≤3	Low/lower middle	Colorectal	Male	60	1	II	III	Elective	0.060 (0.033 to 0.095)	0.022 (0.003 to 0.049, p=0.025)
5	Upper middle	Colorectal	Male	60	1	II	III	Elective	0.019 (0.010 to 0.030)	-
4	Upper middle	Colorectal	Male	60	1	II	III	Elective	0.015 (0.007 to 0.028)	-0.003 (-0.011 to 0.004, p=0.378)
≤3	Upper middle	Colorectal	Male	60	1	II	III	Elective	0.030 (0.014 to 0.052)	0.011 (0.001 to 0.027, p=0.030)
5	High	Colorectal	Male	60	1	II	III	Elective	0.009 (0.005 to 0.016)	-
4	High	Colorectal	Male	60	1	II	III	Elective	0.008 (0.003 to 0.014)	-0.002 (-0.006 to 0.002, p=0.375)
≤3	High	Colorectal	Male	60	1	II	III	Elective	0.015 (0.007 to 0.029)	0.005 (0.001 to 0.016, p=0.023)
5	Low/lower middle	Colorectal	Female	60	1	II	III	Elective	0.029 (0.016 to 0.046)	-
4	Low/lower middle	Colorectal	Female	60	1	II	III	Elective	0.024 (0.011 to 0.041)	-0.005 (-0.018 to 0.007, p=0.368)
≤3	Low/lower middle	Colorectal	Female	60	1	II	III	Elective	0.047 (0.025 to 0.076)	0.017 (0.002 to 0.039, p=0.024)
5	Upper middle	Colorectal	Female	60	1	II	III	Elective	0.015 (0.007 to 0.024)	-
4	Upper middle	Colorectal	Female	60	1	II	III	Elective	0.012 (0.005 to 0.021)	-0.003 (-0.009 to 0.003, p=0.348)
≤3	Upper middle	Colorectal	Female	60	1	II	III	Elective	0.024 (0.011 to 0.041)	0.008 (0.001 to 0.022, p=0.031)
5	High	Colorectal	Female	60	1	II	III	Elective	0.007 (0.004 to 0.012)	-
4	High	Colorectal	Female	60	1	II	III	Elective	0.006 (0.002 to 0.011)	-0.001 (-0.005 to 0.002, p=0.362)
≤3	High	Colorectal	Female	60	1	II	III	Elective	0.012 (0.005 to 0.023)	0.004 (0.000 to 0.012, p=0.029)
5	Low/lower middle	Gastric	Male	60	1	II	III	Elective	0.046 (0.025 to 0.073)	-
4	Low/lower middle	Gastric	Male	60	1	II	III	Elective	0.038 (0.017 to 0.067)	-0.008 (-0.027 to 0.011, p=0.361)
≤3	Low/lower middle	Gastric	Male	60	1	II	III	Elective	0.073 (0.039 to 0.116)	0.026 (0.003 to 0.057, p=0.025)
5	Upper middle	Gastric	Male	60	1	II	III	Elective	0.023 (0.011 to 0.040)	-
4	Upper middle	Gastric	Male	60	1	II	III	Elective	0.019 (0.007 to 0.037)	-0.004 (-0.014 to 0.006, p=0.377)

≤3	Upper middle	Gastric	Male	60	1	II	III	Elective	0.037 (0.017 to 0.066)	0.013 (0.001 to 0.034, p=0.030)
5	High	Gastric	Male	60	1	II	III	Elective	0.012 (0.005 to 0.021)	-
4	High	Gastric	Male	60	1	II	III	Elective	0.009 (0.004 to 0.019)	-0.002 (-0.008 to 0.003, p=0.364)
≤3	High	Gastric	Male	60	1	II	III	Elective	0.019 (0.008 to 0.036)	0.007 (0.000 to 0.019, p=0.033)
5	Low/lower middle	Gastric	Female	60	1	II	III	Elective	0.036 (0.019 to 0.059)	-
4	Low/lower middle	Gastric	Female	60	1	II	III	Elective	0.030 (0.013 to 0.054)	-0.006 (-0.022 to 0.009, p=0.393)
≤3	Low/lower middle	Gastric	Female	60	1	II	III	Elective	0.058 (0.031 to 0.096)	0.021 (0.002 to 0.047, p=0.028)
5	Upper middle	Gastric	Female	60	1	II	III	Elective	0.018 (0.009 to 0.031)	-
4	Upper middle	Gastric	Female	60	1	II	III	Elective	0.015 (0.006 to 0.028)	-0.003 (-0.011 to 0.005, p=0.370)
≤3	Upper middle	Gastric	Female	60	1	II	III	Elective	0.029 (0.013 to 0.053)	0.010 (0.001 to 0.027, p=0.026)
5	High	Gastric	Female	60	1	II	III	Elective	0.009 (0.004 to 0.016)	-
4	High	Gastric	Female	60	1	II	III	Elective	0.007 (0.003 to 0.015)	-0.001 (-0.006 to 0.002, p=0.377)
≤3	High	Gastric	Female	60	1	II	III	Elective	0.015 (0.006 to 0.030)	0.005 (0.000 to 0.016, p=0.029)

Appendix 19. Absolute risk for 30-day mortality associated with four or more hospital facilities within each income group stratified by cancer type and sex for higher risk surgical patients (ASA grade ≥ 3)



Estimates for age 70 years, performance status 3 or 4, ASA grade ≥ 3 , cancer stage III, and elective surgery.

Appendix 20. Absolute risk for 30-day mortality associated with four or more hospital facilities within each income group stratified by cancer type and sex for higher risk surgical patients (ASA grade ≥ 3)

Estimates for age 70 years, performance status 3 or 4, ASA grade ≥ 3 , cancer stage III, and elective surgery.

Hospital facility level	WB income (tertile)	Cancer type	Sex	Age (years)	ECOG performance status	ASA (≥ 3)	Stage	Urgency	Predicted probability of death	Absolute risk difference
>3	Low/lower middle	Colorectal	Male	70	3/4	Yes	III	Elective	0.323 (0.183 to 0.485)	-
≤ 3	Low/lower middle	Colorectal	Male	70	3/4	Yes	III	Elective	0.418 (0.251 to 0.594)	0.093 (-0.005 to 0.185, p=0.061)
>3	Upper middle	Colorectal	Male	70	3/4	Yes	III	Elective	0.201 (0.107 to 0.329)	-
≤ 3	Upper middle	Colorectal	Male	70	3/4	Yes	III	Elective	0.275 (0.147 to 0.430)	0.069 (-0.002 to 0.151, p=0.058)
>3	High	Colorectal	Male	70	3/4	Yes	III	Elective	0.109 (0.054 to 0.183)	-
≤ 3	High	Colorectal	Male	70	3/4	Yes	III	Elective	0.156 (0.072 to 0.277)	0.044 (-0.001 to 0.113, p=0.058)
>3	Low/lower middle	Colorectal	Female	70	3/4	Yes	III	Elective	0.271 (0.147 to 0.423)	-
≤ 3	Low/lower middle	Colorectal	Female	70	3/4	Yes	III	Elective	0.359 (0.205 to 0.534)	0.084 (0.000 to 0.171, p=0.050)
>3	Upper middle	Colorectal	Female	70	3/4	Yes	III	Elective	0.164 (0.085 to 0.272)	-
≤ 3	Upper middle	Colorectal	Female	70	3/4	Yes	III	Elective	0.228 (0.116 to 0.371)	0.061 (-0.003 to 0.141, p=0.061)
>3	High	Colorectal	Female	70	3/4	Yes	III	Elective	0.087 (0.043 to 0.153)	-
≤ 3	High	Colorectal	Female	70	3/4	Yes	III	Elective	0.126 (0.057 to 0.232)	0.037 (-0.000 to 0.097, p=0.054)
>3	Low/lower middle	Gastric	Male	70	3/4	Yes	III	Elective	0.379 (0.218 to 0.551)	-
≤ 3	Low/lower middle	Gastric	Male	70	3/4	Yes	III	Elective	0.478 (0.294 to 0.650)	0.096 (-0.000 to 0.192, p=0.050)
>3	Upper middle	Gastric	Male	70	3/4	Yes	III	Elective	0.243 (0.125 to 0.406)	-
≤ 3	Upper middle	Gastric	Male	70	3/4	Yes	III	Elective	0.326 (0.174 to 0.516)	0.080 (-0.001 to 0.171, p=0.053)
>3	High	Gastric	Male	70	3/4	Yes	III	Elective	0.135 (0.064 to 0.237)	-
≤ 3	High	Gastric	Male	70	3/4	Yes	III	Elective	0.191 (0.086 to 0.343)	0.054 (0.000 to 0.134, p=0.048)
>3	Low/lower middle	Gastric	Female	70	3/4	Yes	III	Elective	0.322 (0.176 to 0.494)	-
≤ 3	Low/lower middle	Gastric	Female	70	3/4	Yes	III	Elective	0.417 (0.245 to 0.594)	0.093 (-0.003 to 0.188, p=0.054)
>3	Upper middle	Gastric	Female	70	3/4	Yes	III	Elective	0.201 (0.101 to 0.335)	-
≤ 3	Upper middle	Gastric	Female	70	3/4	Yes	III	Elective	0.274 (0.139 to 0.438)	0.071 (-0.001 to 0.155, p=0.052)
>3	High	Gastric	Female	70	3/4	Yes	III	Elective	0.109 (0.050 to 0.204)	-
≤ 3	High	Gastric	Female	70	3/4	Yes	III	Elective	0.155 (0.068 to 0.298)	0.043 (-0.001 to 0.119, p=0.054)

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Italy: Margherita Pinto (Azienda Ospedaliera Regionale 'San Carlo'); Fabrizio Perrone (Azienda Ospedaliera Universitaria Consorziale Policlinico Di Bari); Francesca Paola Tropeano (Federico II University of Naples); Francesca Troilo (Hospital G.Bernabeo); Daniela Bossi (ICS Maugeri); Dario Scala (Istituto Nazionale Tumori Fondazione, Pascale-I.R.C.C.S.); Lucrezia Pulitanò (Mater Domini University Hospital); Marcella Carella (Ospedale Generale Regionale F. Miulli); Andrea Pietrabissa (Policlinico San Matteo); Alice Gori (S.Orsola-Malpighi Hospital); Giorgio Giraud (Santa Croce and Carle Hospital); Veronica De Simone (Santa Rita Clinic, Vercelli); Alfio Alessandro Russo (Treviglio Hospital); Bartolomeo Braccio (Università della Campania 'Luigi Vanvitelli', Naples).

Jordan: Raed Al-Taher (Jordan University Hospital); Sarah Athamneh (King Abdullah University Hospital).

Kenya: Andrea Parker (Tenwek Hospital).

Libya: Adnan Sawiee (Alkhadra Hospital); Amina Kattia (Misurata Cancer Center); Malik Salem (National cancer institute); Osama Tababa (New Bridge Hospital); Zuhour Shaeab (Tripoli Central Hospital).

Lithuania: Vilius Syminas (Klaipeda Republic Hospital); Jonas Jurgaitis (Klaipeda University Hospital); Gytė Damulevičienė (Lithuanian University of Health Sciences Kaunas Clinical Hospital); Saulius Svagzdys (Lithuanian University of Health Sciences Kaunas Clinics); Tomas Poskus (Vilnius University Hospital).

Madagascar: Narindra Njarasoa Mihaja Razafimanjato (Joseph Ravoahangy Andrianavalona Hospital).

Malaysia: Ling Chieng Loo (Hospital Sibul); Ing Ching Tiong (Hospital Sultanah Bahiyah); Wan Farahiyah Wan Muhmad (Hospital Tuanku Ja'afar); Harinthiran Vijayan (Hospital Universiti Sains Malaysia); Teoh Li Ying (University Malaya Medical Centre).

Malta: Gabriella Grech (Mater Dei Hospital).

Mexico: Rodrigo Arrangoiz (ABC Medical Center); Vania Brickelia Jimenez Ley (ANKER Oncologia Global Especializada); Daniel Arizpe (Hospital Angeles Puebla); Vania Brickelia Jimenez Ley (Hospital de Especialidades, CMNO-IMSS); Elizabeth Lagunes Lara (Hospital Español Veracruz); Elizabeth Victoria Castro López (Hospital Regional de Alta Especialidad); Jose Eazim (Instituto Nacional de Ciencias Médicas y Nutrición 'Salvador Zubirán').

Netherlands: Marije Gordinou de Gouberville (Amsterdam UMC VUmc); Vivian Bastiaenen (Amsterdam UMC, University of Amsterdam); Simone Rottier (Tergooi Hospital).

New Zealand: Fouad Nahab (North Shore Hospital); Maria Yeonhee Ji (Taranaki Base Hospital).

Nigeria: Mohammed Seyoji (Ahmadu Bello University Teaching Hospital); Callistus Nwachukwu (Aminu Kano Teaching Hospital); Okechukwu Emeghara (Babcock University Teaching Hospital); Sayyid Egbunu Muhammed (Barau Dikko Teaching Hospital); Ayodeji Idowu (Ekiti State University Teaching Hospital); Olamiposi Sowemimo (Obafemi Awolowo University Teaching Hospitals Complex); Olakayode Ogundoyin (University College Hospital); Oluwatosin Akande (University of Ilorin Teaching Hospital).

Norway: Alexander Lott (University Hospital Of North Norway).

Pakistan: Maliha Nadeem (Ganga Ram Hospital); Ahsan Ali Laghari (Liaquat University of Medical & Health Sciences); Asif Loya (Shaukat Khanam Memorial Cancer Hospital and Research Centre); Hassan Mushtaq (Sindh Institute of Urology and Transplantation); Muhammad Tariq Abdullah (The Pakistan Institute of Medical Sciences).

Palestine: Baseel Abuhilal (Al Makassed Islamic Charitable Society Hospital Jerusalem); Mohammad Atawneh (Al-Ahli Hospital); Hamdan Hamdan (Beit Jala Governmental Hospital (Al Hussein)); Belal Alhabil (Indonesian Hospital); Abedelrahman Srour (Palestine Medical Complex); Ibrahim Mousa (Rafidia Hospital).

Paraguay: Luis Da Silva Medina (Hospital de Clínicas, II Cátedra de Clínica Quirúrgica, Universidad Nacional de Asunción).

Philippines: Marie Dione Sacdalan (José R. Reyes Memorial Medical Center); Marie Carmela Lapitan (Philippine General Hospital, University Of The Philippines Manila); Marie Dione Sacdalan (Quirino Memorial Medical Center); Marie Dione Sacdalan (The Medical City).

Poland: Katarzyna Bartosiak (Military Institute Of Medicine).

Portugal: Pedro Ferreira (Centro Hospitalar de Setúbal); Vítor Francisco (Centro Hospitalar do Baixo Vouga); Ricardo Lemos (Centro Hospitalar do Medio Ave); Luísa Frutuoso (Centro Hospitalar Entre o Douro e Vouga); Sara Fernandes (Centro Hospitalar Lisboa Norte); Telma Fonseca (Centro Hospitalar Sao Joao); Jorge Pereira (Centro Hospitalar Tondela-Viseu); Juan Rachadell (Centro Hospitalar Universitario do Algarve); Ana Torre (Centro Hospitalar Vila Nova de Gaia/Espinho); Filipe Madeira Martins (Hospital da Horta, E.P.E.); Ana Cristina Carvalho (Hospital da Senhora da Oliveira); Joana Rodrigues Ferreira (Hospital de Egas Moniz); Bruno Ribeiro da Silva (Hospital de Santa Luzia); Helena Devesa (Hospital de Santarem); Ana Vieira (Hospital de Santo Espirito da ilha Terceira); Inês Mónica (Hospital Distrital da Figueira da Foz); Margarida Amaro (Hospital do Espirito Santo); Diogo Sousa (Hospital do Litoral Alentejano); Marta Reia (Hospital Doutor José Maria Grande); João Louro (Hospital Geral - Centro Hospitalar de Coimbra); Ana Martins (Hospital Prof. Doutor Fernando Fonseca, E.P.E.); Joaquina Dominguez (Hospital Santa Luzia Elvas); Inês Santos (Hospital Sao Francisco Xavier); Nuno Miguel Freitas Oliveira (Hospital Vila Franca de Xira); José Carlos Pereira (IPO Porto); Pedro Silva-Vaz (Unidade Local de Saúde de Castelo Branco); Ligia Freire (Unidade Local de Saude de Matosinhos - Hospital Pedro Hispano); Ricardo Escrevente (Unidade Local de Saude do Baixo Alentejo).

Romania: Valentina Madalina Negoita (Emergency Clinical Hospital Bucharest).

Russian Federation: Dmitry Shakhmatov (State Scientific Centre of Coloproctology).

Rwanda: Yves Nezerwa (Rwanda Military Hospital).

Serbia: Radosav Radulovic (Zvezdara University Medical Center).

South Africa: Rachel Moore (Chris Hani Baragwanath Academic Hospital); Gareth Obery (Groote Schuur Hospital); Francois Viljoen (Inkosi Albert Luthuli Central Hospital); Tome Mendes (Mitchell's Plain District Hospital).

Spain: Antonio Suarez (12 de Octubre University Hospital); Enrique Moncada (Álvaro Cunqueiro Hospital); Maria Fernandez-Hevia (Central University Hospital Of Asturias); Carolina Curtis Martínez (Hospital General Universitario de Elche); Julia Maria Gil Garcia (Hospital Universitari de Girona Dr. Josep Trueta); Mariana González Zunzarren (Infanta Sofía University Hospital).

Sudan: Tarig Idris (Ibrahim Malik Teaching Hospital).

Sweden: Karolina Eklöv (South General Hospital); Oskar Grahn, Leila Amin (Umea University Hospital); Malin Blomqvist (Vrinnevi Hospital).

Switzerland: Costanza Ajani (Ente Ospedaliero Cantonale); Rebecca Kraus (Kantonsspital Graubunden); Nico Seeger (Kantonsspital Winterthur); Melissa Willemin (Lausanne University Hospital CHUV).

Syrian Arab Republic: Fadi Rayya (Al-Assad University Hospital); Mohammad Ayash (Al-Bairouni University Hospital); Raneem Msouti (Al-Mouwasat University Hospital); Israa Kannas (Aleppo University Hospital); Eias Abazid (Damascus Hospital); Asil Esper (Tishreen University Hospital).

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Turkey: Akil Serdar Kavcar (Acibadem Atakent Hospital); Erman Aytac (Acibadem Maslak Hospital); Ahmet Cem Dural (Bakirkoy Dr. Sadi Konuk Training And Research Hospital); Ayse Ilker (Cerrahpasa Medical Faculty Istanbul University); Ismail Cem Eray (Cukurova University Faculty of Medicine); Eray Kurnaz (Erzincan University Hospital); Saygin Altiner (Gazi University Medical Faculty Hospital); Mustafa Deniz Tepe (Karadeniz Technical University Farabi Hospital); Can Şahin (Memorial Ankara Hospital); Evrim Savli (Samsun Training and Research Hospital).

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Ukraine: Andrii Diachenko (Dnepropetrovsk Regional Clinical Oncology Center); Vladislav Hordoskiy (Kyiv Regional Clinical Hospital).

United Kingdom: Heather Curry (Aberdeen Royal Infirmary); Charlene Yat Che Chau (Addenbrooke's Hospital); Harry Robertson (Bristol Royal Infirmary); Arin Mahmoud (Broomfield Hospital); Hannah Lennon (Countess of Chester Hospital); Lynette Loi (Gartnavel General Hospital); Emily Kirkham (Gloucestershire Royal Hospital); Cameron McCann (Hairmyres Hospital); Daniel Watts (John Radcliffe Hospital); Binay Gurung (Leicester Royal Infirmary); Michael Wilson (Ninewells Hospital); Thomas Tribedi (Nottingham City Hospital); Eleonora Garofalo (Queen Alexandra Hospital); Baryab Zahra (Queen Elizabeth University Hospital); Scott MacDonald (Royal Alexandra Hospital); Ian Daniels (Royal Devon and Exeter Hospital); Nathan Ng (Royal Infirmary of Edinburgh); Shivun Khosla (Royal Surrey County Hospital); James Olivier (Southmead Hospital); Sum Yu Pansy Yue (St Thomas' Hospital); Gayathri Suresh (The Christie Hospital); Jack Wellington (University Hospital of Wales); Emmanuel Lorejo (West Suffolk Hospital); Mafdi Mossaad (Wexham Park Hospital); Yegor Trylisky (Worthing Hospital).

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