



# Impact of a transition of care bundle on health-related quality of life after major emergency abdominal surgery: before-and-after study

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## Abstract

**Introduction:** The transition from hospital to home can be challenging. This study investigated whether a standardized transition of care bundle could enhance health-related quality of life (HRQoL), reduce readmission rates, and increase days alive and out of hospital after major emergency abdominal surgery.

**Methods:** A single-centre before-and-after study including consecutive patients undergoing major emergency abdominal surgery was conducted at Copenhagen University Hospital Herlev from 1 January 2022 to 31 December 2023. A transition of care bundle including standardized discharge coordination, written material, and multidisciplinary information meetings for patients and relatives was implemented on 1 January 2023. Patients were followed up by phone interviews and hospital records. HRQoL was assessed by the EQ-5D-5L questionnaire.

**Results:** A total of 667 patients were included (before group 333 patients (median age 70.9), after group 335 patients (median age 72.2)). The predominant surgical procedure was emergency laparotomy for bowel obstruction (before group:  $n = 187$ , 56.2%, after group:  $n = 171$ , 51.5%). HRQoL was significantly higher in the after group compared with the before group at postoperative day (POD) 30 (0.846 versus 0.750,  $P < 0.001$ ), postoperative day 90 (0.925 versus 0.847,  $P < 0.001$ ), and at postoperative day 180 (0.907 versus 0.875,  $P = 0.039$ ). No difference in days alive and out of hospital or readmission was found between the groups. A significant reduction in patients transitioning to a rehabilitation facility at discharge was found in the after group versus before group (12.5% versus 23.3%).

**Conclusions:** A transition of care bundle with coordination, written material, and multidisciplinary efforts increased HRQoL up to 180 days after major emergency abdominal surgery.

## Introduction

Major emergency abdominal surgery, including emergency laparotomy, is a commonly performed surgical procedure with an annual incidence of up to 1:1100 in Western populations<sup>1</sup>. It is, however, still associated with high postoperative morbidity and mortality rates. In recent years a focus on standardizing treatment for this patient population with pre- and intraoperative bundles of care and guidelines developed by the Enhanced Recovery After Surgery group has substantially improved morbidity and mortality rates<sup>2–6</sup>. However, readmission is still very common and up to 50% of the patients undergo repeating readmissions due to long-term ill health<sup>7,8</sup>. All the above can influence postoperative quality of life and patients value postoperative quality of life highly in decision-making for emergency laparotomy<sup>9</sup>. Quality of life can be affected up to 12 months after emergency laparotomy<sup>10</sup>.

The transition from hospital to home/rehabilitation facility/nursing home is challenging and patients can be left feeling

unprepared at discharge with limited understanding of their medications and diagnosis and confusion about their discharge plan<sup>11,12</sup>. Transitional care interventions aim to avoid poor outcomes caused by uncoordinated care, such as preventable readmissions. Although no clear set of components defines transitional care interventions, they focus on patient or caregiver education, medication reconciliation, and coordination among health professionals involved in the transition<sup>13</sup>. Interventions consisting of patient education during admission and discharge planning have been found effective in improving quality of life and reducing the rate of readmission in a variety of medical patients<sup>14–16</sup>.

Transition of care interventions have not been a focus of prior investigations in major emergency abdominal surgery. This study aimed to primarily investigate whether a simple standardized transition of care bundle with a focus on discharge planning and patient education could improve patient-reported health-related

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quality of life (HRQoL) at postoperative day (POD) 30, 90, and 180 and, secondarily, if it could increase days alive and out of hospital (DAOH) and reduce readmissions after major emergency abdominal surgery.

## Methods

The study was approved by the Danish Data Protection Agency and the Capital Region of Copenhagen (P-2021-431 and P-2022-419). Contacting patients by phone after discharge has previously been approved by the Danish medical research ethics committee (H-21027246). As this study was an initiative to increase quality of patient care and consisted of a policy change at the local hospital department, no ethical approval was needed in accordance with Danish law.

## Data source and study population

This is a single-centre before-and-after study. Consecutive patients undergoing major emergency abdominal surgery due to bowel obstruction, bowel perforation, intra-abdominal bleeding, or ischaemia either as an index surgery or as an acute reoperation after elective surgery at the Copenhagen University Hospital Herlev and Gentofte during 2 years from 1 January 2022 to 31 December 2023 were included. The before group (control) consisted of patients undergoing surgery from 1 January 2022 to 31 December 2022 and the after group (intervention) comprised patients undergoing surgery from 1 January 2023 to 31 December 2023. Patients were excluded if they died during index admission. Copenhagen University Hospital Herlev and Gentofte serves a population of 465 000 inhabitants performing approximately 400 high-risk emergency abdominal surgeries annually. The department utilizes a specialized multidisciplinary perioperative protocol for patients with severe intra-abdominal conditions requiring emergency abdominal surgery named AHA (Acute High-risk Abdominal surgery) comprised of previously described elements of pre-, intra-, and postoperative standards<sup>2,17,18</sup>. All patients are admitted following surgery to a dedicated emergency surgery ward and ward rounds are performed by consultant emergency surgeons during weekdays.

Data were prospectively registered in the patient records and subsequently collected in a REDCap (Research Electronic Data Capture) database. The variables comprised patient demographics, intraoperative data, short-term outcomes (including intensive care unit pathways, medical and surgical complications, rate of reoperation after index surgery), and rate of readmission.

Follow-up was achieved through patient records and by phone interview on POD 30, 90, and 180. If the patient was unreachable, the patient was called again a second time within the following days. If the patient did not answer the second phone call, they were not called again until the time for the next follow-up. Phone interview follow-up POD 180 was terminated on 1 November 2023 due to a structural redistribution of personnel resources.

## Transition of care bundle

On 1 January 2023, a standardized transition of care bundle was implemented in the department. The bundle consisted of three parts: increased awareness and coordination of the discharge phase; newly developed targeted written material; and multidisciplinary information meetings for patients and their relatives. Before implementation of the bundle, information and discharge planning was undertaken by the individual surgeon doing ward rounds that day and carried out how he or she found suitable.

The awareness and coordination effort consisted of immediate tentative planning of the discharge from the first postoperative ward round. This planning was aided by completion of a standardized hospital record discharge template. The planning consisted of considerations on the tentative timing of discharge, the location to which the patient likely would be discharged to, and decisions on increased domestic help or rehabilitation facility at discharge. The discharge plan was evaluated daily taking the patient's postoperative course into account and involvement of the patient's relatives was done to the largest extent. All patients were aimed to be discharged by an emergency surgeon and if discharge was planned on weekends, the consulting emergency surgeon on the Friday ward round planned for the discharge.

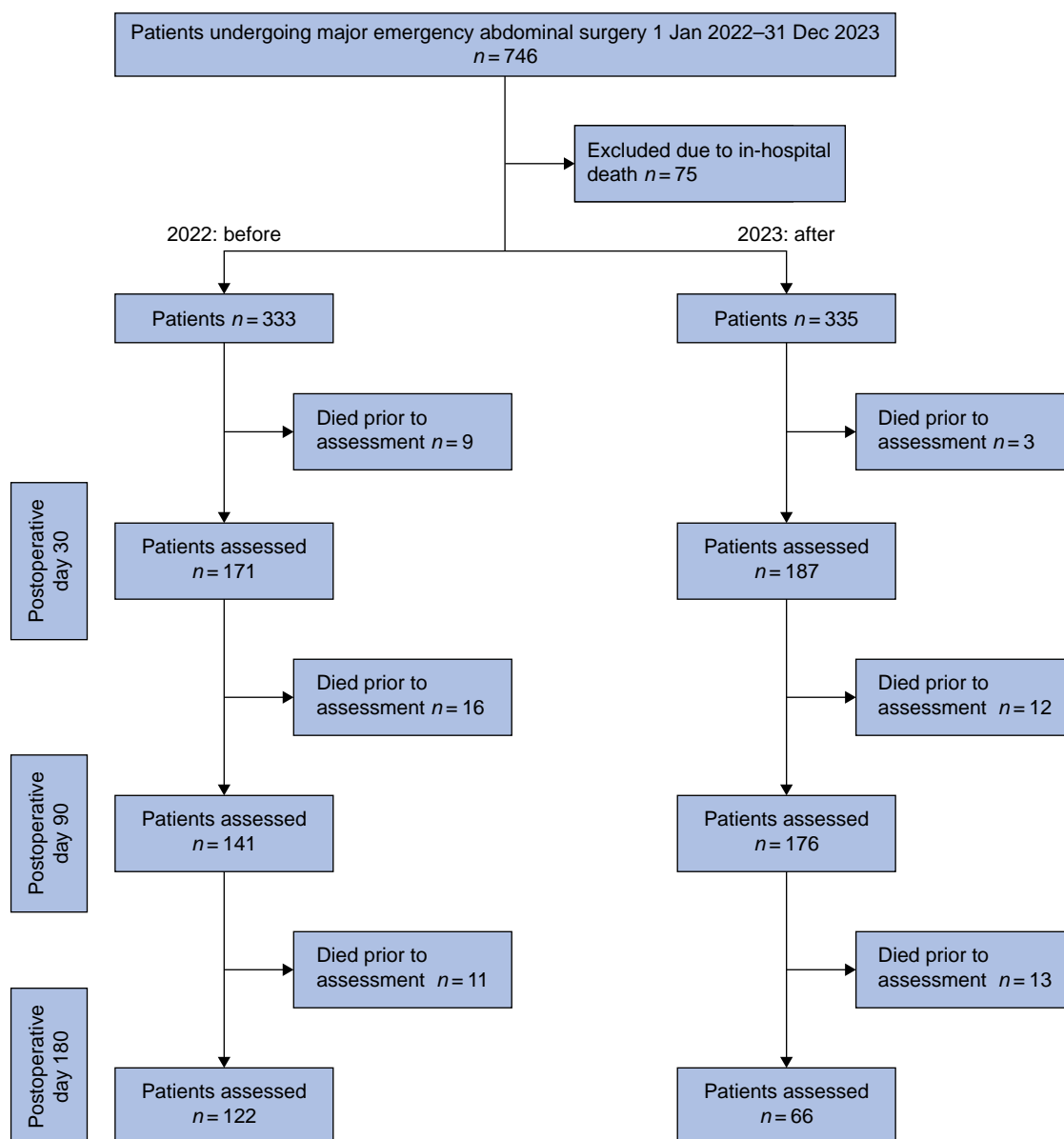
The newly developed written material described the anticipated course of rehabilitation after discharge. A pamphlet entitled 'What to expect of the next six months' was developed in collaboration between the department and a general practitioner (GP) and described the expected postoperative course after discharge and when to expect to return to normal activities, the risk of relapse, prolonged fatigue, and mental challenges, what to do in case of suspicion of relapse, and which problems should be handled by a GP ([Supplementary material S1](#)). The material emphasized matching expectations with the patients and their relatives and information on which symptoms to react to. A paragraph on initial mobilization and muscle strength rehabilitation was developed by a physiotherapist and contained specific exercises the patients could perform at home. A 'Diet and nutrition after surgery' pamphlet was developed by dieticians with a detailed description of what to eat to accommodate for the surgical stress and muscle wasting the body suffered during admission and the recovery phase with easy tips and tricks on handling nutrition at home ([Supplementary material S2](#)). Furthermore, written material on wound care was developed by nurses and a plastic surgeon describing how to handle wounds and incisions at home ([Supplementary material S3](#)).

All patients and their relatives were invited and encouraged to attend a multidisciplinary information meeting concerning the time after discharge. The group meetings were held at the ward once every week and lasted for 30–60 min. A multidisciplinary team of an emergency surgeon, a nurse, a dietician, and a physiotherapist explained the information from the written material, and after the presentations from the professionals, the patients and their relatives had time for questions and discussions both with the professionals but also with each other. All patients that were able to participate did so and patients could participate more than once if the admission extended over more than one meeting day.

## Outcomes

The primary outcome measure was HRQoL at POD 30, 90, and 180. Secondary outcome measures included DAOH within 90 days (DAOH<sub>90</sub>) and 180 days (DAOH<sub>180</sub>) and readmission rates on POD 30, 90, and 180.

HRQoL was assessed using the EQ-5D index developed by the EuroQol group<sup>19</sup>. EQ-5D is a widely used tool and comprises a short descriptive system questionnaire (EQ-5D-5L) and a visual analogue score (EQ-VAS) that takes a few minutes to complete. The EQ-5D-5L illustrative system includes five domains: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. Each domain is scored on a 5-point scale: 1, no problem; 2, slight problem; 3, moderate problem; 4, severe problem; 5, unable to do/extreme problem. The EQ-VAS scale measures patient-perceived



**Fig. 1** Flowchart of patient inclusion

overall health from 0 to 100, where 0 is the worst imaginable health and 100 is the best. The responses were converted to a utility score (value) using recently published preference-based scoring systems derived from the general Danish population<sup>20,21</sup>.

DAOH at 90 (DAOH<sub>90</sub>) and 180 days (DAOH<sub>180</sub>) were calculated for all patients<sup>8</sup>. The day of surgery was calendar day 0, and all subsequent days in hospital or dead were subtracted from the study period of 90 or 180 days. Both total and part-days in the hospital were subtracted; thus, the maximum possible values for DAOH<sub>90</sub> and DAOH<sub>180</sub> were 89 and 179 respectively. This method has previously been described in detail<sup>22–24</sup>.

## Statistics

The distribution of continuous data was assessed by visual inspection of histograms. The median and interquartile ranges were calculated for non-parametric data. Mean and standard deviation were calculated for data with normal distribution. The Mann–Whitney U test was used for the comparison of non-parametric data and the t-test was used for data with normal distribution. Categorical data

were presented as the number of cases and percentages. Differences (for both binary and polytomous variables) between the before and after groups were analysed using Pearson's chi-square test and Fisher's exact t-test when appropriate.

IBM SPSS Statistics version 27 for Windows (IBM Corp. Released 2020. IBM SPSS Statistics for Windows, Version 27.0. Armonk, NY, USA: IBM Corp.) was used to compute the statistics.

## Results

A total of 75 patients (10.1%) died during the index admission, leaving a total of 333 patients for inclusion in the before (control) group and 335 patients in the after (intervention) group (Fig. 1). The median age in the before group was 70.9 years, and the majority of the included patients underwent emergency laparotomy for bowel obstruction ( $n = 187$ , 56.2%). Similarly, the median age in the after group was 72.2 years, and the majority of the included patients underwent emergency laparotomy for bowel obstruction ( $n = 171$ , 51.5%). Patient characteristics and

**Table 1** Demographics and clinical characteristics in the before and after groups

Patient characteristics	Before group (n = 333)	After group (n = 335)	P
Sex, male	160 (48.0)	144 (43.0)	0.189
Age (years), median (i.q.r.)	70.9 (56.9–79.8)	72.2 (58.2–79.8)	0.200
Body mass index (kg/m <sup>2</sup> ), median (i.q.r.)	24.3 (21.7–27.6)	24.6 (21.4–27.8)	0.698
<b>Co-morbidities</b>			
ASA physical status			0.525
I	51 (15.3)	56 (16.8)	
II	143 (48.9)	147 (44.1)	
III	106 (31.8)	119 (35.7)	
IV	13 (3.9)	10 (3.1)	
V	0	1 (0.3)	
WHO performance status			0.081
0	161 (48.9)	149 (44.9)	
1	104 (31.6)	126 (38.8)	
2	38 (11.6)	45 (13.6)	
3	22 (6.7)	10 (3.0)	
4	4 (1.2)	2 (0.6)	
<b>Open/laparoscopic procedure</b>			0.962
Open	165 (49.5)	166 (49.6)	
Laparoscopic	74 (22.2)	77 (23.0)	
Laparoscopic converted to open	94 (28.2)	92 (27.5)	
<b>Intraoperative pathology</b>			
Obstruction	187 (56.2)	171 (51.5)	0.229
Perforation	87 (26.1)	71 (21.4)	0.151
Ischaemia	17 (5.1)	12 (3.6)	0.347
Fascial dehiscence	1 (0.3)	5 (1.5)	0.100
Incarcerated/strangulated hernia	8 (2.4)	20 (6.0)	<b>0.020</b>
Other	64 (19.2)	70 (21.1)	0.549
<b>Postoperative course</b>			
Postoperative complication (Clavien Dindo score $\geq 2$ )*	135 (40.5)	150 (44.8)	0.268
Postoperative ICU stay	52 (15.6)	48 (15.3)	0.641
Length of stay, median (i.q.r.), days	5 (3–11)	5 (3–10)	0.152
Destination at discharge			<b>&lt;0.001</b>
Own home without help	212 (64.2)	274 (83.8)	
Own home with help	39 (11.8)	11 (3.4)	
Rehabilitation facility	77 (23.3)	41 (12.5)	
Hospice/palliative care at home	2 (0.6)	1 (0.3)	

Values are n (%) unless stated otherwise. Values in bold are statistically significant. \*Other pathology being bleeding, non-traumatic spleen rupture, anastomotic leakage, intra-abdominal abscess, or laparotomy with no pathology found. ASA, American Society of Anesthesiologists; WHO, World Health Organization; ICU, intensive care unit.

perioperative data were comparable across study groups and are presented in [Table 1](#).

## Bundle compliance

All patients in the after (intervention) group received two-thirds of the bundle (all parts of the awareness and coordination effort and all the written material). A total of 23.3% of the patients received the entire bundle (awareness and coordination, all written material, and meeting attendance). Reasons for not attending the meetings were mental exhaustion or inability to take in information (44.4%), admitted to the intensive care unit during the time of meeting (10.5%), pain preventing the patients from participating (9.7%), language barrier (8.1%), respiratory insufficiency and need for oxygen at the time of the meeting (7.3%), nasogastric tube with the need for continuous suction (4.8%), did not wish to participate (4.8%), isolated at the ward due to antibiotic-resistant infection (4.0%), decreased cognition (dementia, delirium) (4.0%), or not present in the ward at the time of the meeting (2.4%). Detailed information on the implementation rate of bundle elements is presented in [Table 2](#).

## Health-related quality of life, days alive and out of hospital, and readmission

HRQoL was significantly improved in the after (intervention) group compared with the before (control) group on POD 30, 90, and 180 ([Table 3](#)). At POD 30, a statistically significant lower

**Table 2** Implementation rate of discharge information bundle elements

	Target	Compliance
<b>Discharge coordination and awareness</b>		
Planning of discharge from first ward round	>80%	335 (100%)
Standardized hospital record template	>80%	335 (100%)
Discharge by emergency surgeon	>80%	335 (100%)
<b>Written material</b>		
'What to expect of the next 6 months'	>80%	335 (100%)
'Diet and nutrition'	>80%	335 (100%)
'Wound care'	>80%	335 (100%)
<b>Information meetings</b>		
Patient attendance	>50%	78 (23.3%)
Relative attendance	>50%	40* (11.9%)

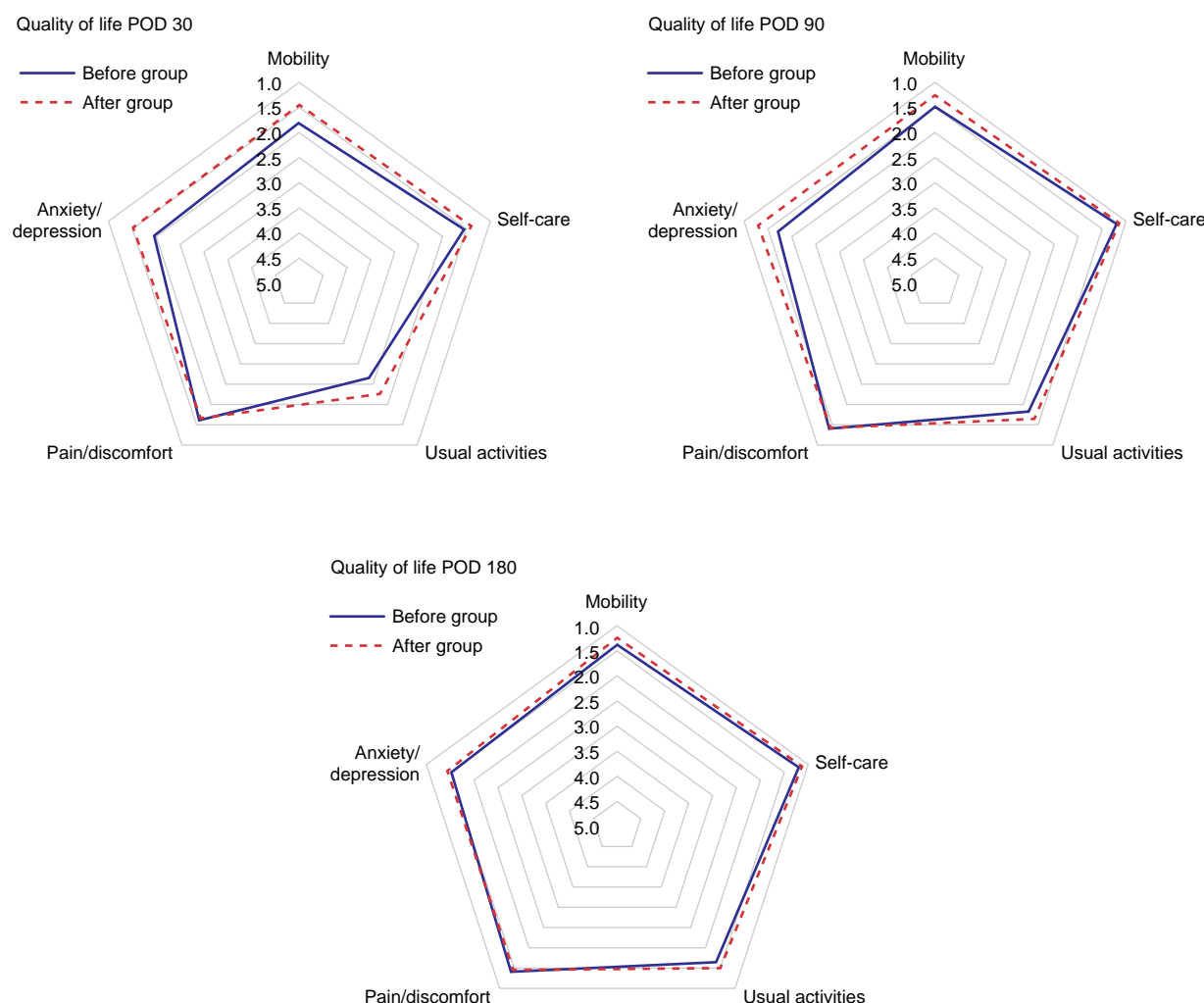
\*Relatives (one or more) of 40 patients.

mean utility score in the before (control) group compared with the after (intervention) group was found in the following domains: mobility, self-care, usual activities, and anxiety/depression ( $P < 0.001$ ; [Fig. 2](#) and [Table S4](#)). Similarly, on POD 90 a statistically significant lower mean utility score in the before group compared with the after group was found in the following domains: mobility ( $P < 0.001$ ), self-care ( $P = 0.027$ ), usual activities ( $P < 0.001$ ), and anxiety/depression ( $P < 0.001$ ) ([Fig. 2](#) and [Table S4](#)). On POD 180 a statistically significant lower mean utility score in the before group compared with the after group was found in the following domains: mobility ( $P = 0.041$ ), usual

**Table 3** Quality of life, readmission, and days alive and out of hospital in the before and after groups

		Before group	After group	P
QoL day 30, mean(s.d.)	n	171 0.750(0.265)	187 0.846(0.196)	<b>&lt;0.001</b>
QoL day 90, mean(s.d.)	n	141 0.847(0.207)	176 0.925(0.0866)	<b>&lt;0.001</b>
QoL day 180, mean(s.d.)	n	122 0.875(0.198)	66 0.907(0.148)	<b>0.039</b>
<b>Days alive and out of hospital</b>	n	333	335	
DAOH 90, mean(s.d.)		74.6(18.8)	75.9(17.7)	0.150
DAOH 180, mean(s.d.)		155.1(40.5)	157.6(37.9)	0.087
<b>Readmission</b>	n	333	335	
30-day readmission		74 (22.2)	81 (24.2)	0.549
90-day readmission		118 (35.4)	118 (35.2)	0.954
180-day readmission		140 (42.0)	147 (43.9)	0.631

Values are number of patients (%) unless stated otherwise. Values in bold are statistically significant. QoL = Quality of life. DAOH = Days alive and out of hospital.

**Fig. 2** Radar plot depicting health-related quality of life by 5Q-5D-5L at postoperative day 30, 90 and 180 for the before (control) and after (intervention) groups POD, postoperative day.

activities ( $P = 0.008$ ), and anxiety/depression ( $P = 0.031$ ) (Fig. 2 and Table S4). A significant reduction in patients discharged to own home with help and to a rehabilitation facility was found in the after group compared with the before group (3.4% versus 11% and 12.5% versus 23.3%; Table 1).

A 100% follow-up was achieved regarding readmission and DAOH. DAOH and readmission rates were comparable in the before and after groups (Table 3).

## Discussion

This before-and-after study found that a simple transition of care bundle including early discharge planning and focused written and verbal discharge material increased HRQoL at day 30, 90, and 180 after major emergency abdominal surgery. No difference in DAOH and readmission rates was found after the implementation of the bundle; however, a significant reduction



in patients discharged to a rehabilitation facility was found in the after group compared with the before group.

A scarcity of literature exists on transition of care interventions after surgery. The results from the current study are in line with a qualitative study concerning patient and clinician perceptions on transition of care after trauma and acute care surgery, which found communication, discharge teaching and written instructions, and outpatient care coordination to be essential elements in improving transition of care for this patient population<sup>12</sup>. All parts of this transition of care bundle were executed at the hospital without the involvement of the community setting, making it a simple solution; however, the bundle did not affect the secondary outcomes of readmission and days at home, which were similar in the before and after groups. This suggests the intervention might not be enough to reduce readmission and increase days at home. Follow-up by GPs has been found to be effective in reducing readmission rates after hospitalization for a variety of medical conditions<sup>25–27</sup>. Increased involvement of primary care physicians might benefit the transition process after surgery and should be a focus of future interventions<sup>28,29</sup>. It proved to be difficult to increase attendance at the information meetings as the patients were quite physically and mentally exhausted after surgery. An increase in attendance either by increasing the time interval from surgery to the meeting to make it closer to mimic the time interval at which a GP could be consulted for a follow-up or by making the meetings digital to accommodate flexibility for the individual patient and their relatives might facilitate an increased effect on readmission rates.

A significant increase in patients discharged to their own home without help was found in the after cohort compared with the before cohort. Whether this significant difference was due to the intervention—patients were more ready to be discharged to their own home without help because of better planning and information while admitted—or whether other factors could explain that more patients were discharged to their own home cannot be definitively decided from this study design. However, no significant difference was found in patient characteristics (co-morbidities, complications, etc.) between the groups, indicating that the intervention might be a contributing factor.

This study found a statistically significant numerical improvement in HRQoL after implementation of the transition bundle. The numerical increase in HRQoL moved the population from a HRQoL below the general Danish population average of 0.90 (the before cohort mean HRQoL 0.750–0.875) to a HRQoL higher than the general population average (the after cohort mean HRQoL 0.846–0.925), suggesting a clinically relevant increase making the population of patients undergoing emergency laparotomy after implementation of the bundle comparable to the general Danish population 90 days and further after surgery<sup>21</sup>.

There are some limitations to this study. This is a single-centre study, which could limit the generalizability to all centres and practices globally. To address this limitation future research should focus on conducting multicentre studies involving multiple countries. Furthermore, a proportion of patients were unreachable by telephone for follow-up. The telephone calls were always during working hours, and this was perhaps not suitable for all patients and could have led to the attrition in completed interviews. However, the proportion of patients unreachable was similar in the before (control) and after (intervention) groups, and demographic data between the groups were comparable. Patients might value quality of life higher than the risk of mortality when undergoing emergency

laparotomy<sup>9</sup>, making the findings of this study important in a broader context. The transition bundle is simple, does not require many resources, and does not require complex collaboration across sectors, which could make the framework and concepts readily implementable across different hospital systems. A digitalization of the oral material and meetings could make the bundle even easier to implement and investigations into digitalized information material should be utilized in the future while understanding that this will not give the patients the same opportunities to share experiences as physical meetings. No health economic data were present for this study and could be assessed in future studies.

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## Disclosure

All authors declare no conflicts of interest for this research.

## Supplementary material

[Supplementary material](#) is available at *BJS Open* online.

## Data availability

Due to Danish law, data cannot be made publicly available, but data can be made available upon request.

## Author contributions

Dunja Kokotovic (Conceptualization, Formal analysis, Writing—original draft, Writing—review & editing), Liv í Soylu (Data curation, Writing—review & editing), Therese Hansen (Data curation, Writing—review & editing), Julie Knoblauch (Data curation, Writing—review & editing), Camilla Balle (Data curation, Writing—review & editing), Lisbeth Jensen (Data curation, Writing—review & editing), Andrea Kjørboe (Data curation, Writing—review & editing), Simon Amler (Data curation, Writing—review & editing), Thomas Jensen (Conceptualization, Writing—review & editing), and Jakob Burcharth (Conceptualization, Project administration, Supervision, Writing—review & editing)

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