

ORGANISATION AND EARLY OUTCOMES OF MAJOR UPPER GASTROINTESTINAL CANCER SURGERY IN DENMARK 1996–2004

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ABSTRACT

Background: To assess the relationship between hospital volume and early postoperative outcome the incidence and early outcome of all esophagectomies, pancreaticoduodenectomies and gastric resections in Denmark from 1996 to 2004 was described.

Methods: The National Patient Registry and discharge information from all hospital departments were analysed for all the operations due to a malignant diagnosis. All information was examined for postoperative length of stay and hospital mortality.

Results: During the study period 26 departments performed at least one esophageal resection, 13 departments performed at least one Whipple procedure and 37 departments performed at least one gastric resection. Four departments performed more than 20 esophageal resections per year, whereas one department performed more than 20 Whipple procedures and one more than 20 gastric resections per year. The overall mean length of stay was 21.6 days, 24 days and 18 days for esophageal, pancreatic and gastric resections, respectively, with no difference between high and low volume departments. The hospital mortality was 8.6%, 8.9% and 8.2%, respectively.

Conclusion: The overall high mortality and long postoperative stay in patients undergoing upper gastrointestinal cancer surgery in Denmark calls for improvement by regionalisation into 3–4 departments and monitoring of results.

Key words: Cancer surgery; volume; outcomes; esophageal cancer; pancreatic cancer; gastric cancer; surgery; volume; length of stay; hospital mortality

INTRODUCTION

Despite major improvement in pre- and postoperative care, anaesthesia and operative techniques, the hospital mortality for upper gastrointestinal cancer surgery remains high at many centres. However, large studies have demonstrated better outcome in high-volume centres and when surgeons have a large

experience (1–8). Subsequently, much debate has focused on the importance of regionalizing major cancer surgery.

In Denmark with 5.5 million inhabitants nationwide results from the period 1996 to 2000 demonstrated that esophagectomy and pancreaticoduodenectomy were performed in 26 and 12 departments respectively, and with a hospital mortality of 11.3% and 10.7% (9,10). Similarly, a survey of gastric cancer surgery showed that these operations were performed in about 20 departments and with a hospital mortality of 8.6% (11). Consequently, it was recommended to reorganize the surgery of these respective procedures to three to five centres in order to allow sufficient statistical analysis of data between departments and to improve nation-wide outcome quality.

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The aim of this study was to describe the incidence of all upper gastrointestinal cancer surgery defined as esophagectomies, pancreaticoduodenectomies and gastric resections in Denmark from 1996 to 2004 and to assess the nation-wide organisation of these procedures and the relationship between hospital volume and early postoperative outcome.

PATIENTS AND METHODS

The analysis is performed according to a general model developed for evaluating postoperative morbidity (12,13). The National Patient Registry and discharge information from all hospital departments in the period of January 1 1996 to December 31 2004 were analysed for all esophagectomies (1997–2004), pancreaticoduodenectomies (Whipple's operation) (1996–2004) and gastric resections (Billroth I and II and total gastrectomies) (1999–2004). Only patients with a malignant diagnosis were included.

TABLE 1

Distribution of esophageal resections, length of stay and hospital mortality in Denmark 1997–2004.

	1997–2000	2001–2004
Number of patients (total)	545	607
Number of departments (total)	26	19
Number resections per year:		
<5	19	13
5–20	3	3
>20	4	3
Mean length of stay (days)	19.2	22.0
Hospital mortality ((%) 95%CI)	9.1 (6.9–11.9)	8.1 (6.0–10.6)
Hospital mortality in relation to resections per year / department:		
<5	17.9 (8.9–30.4)	22.2 (12.7–34.5)
5–20	7.1 (2.9–14.1)	3.3 (1.8–7.0)
>20	10.7 (7.5–14.7)	8.3 (6.2–12.6)

TABLE 2

Distribution of pancreaticoduodenectomies, length of stay and hospital mortality in Denmark 1996–2004.

	1996–2001	2002–2004
Number of patients (total)	363	218
Number of departments (total)	13	8
Number resections per year:		
<5	8	3
5–20	5	4
>20	0	1
Mean length of stay (days)	24.5	23.9
Hospital mortality ((%) 95%CI)	10.2 (7.5–14.2)	6.7 (3.9–11.1)
Hospital mortality in relation to resections per year / department:		
<5	10.0 (3.3–21.8)	6.3 (0.2–30.2)
5–20	10.2 (7.0–13.4)	7.6 (3.7–13.7)
>20	–	5.6 (1.6–13.8)

All information was examined for the length of post-operative stay, readmissions within 30 days and hospital mortality, defined as any death during the first 30 days after operation or during the same hospitalisation or readmission within 30 days.

RESULTS

Between 1996 and 2004 a total of 2270 patients underwent one of three procedures for cancer in the upper gastrointestinal tract (Table 1–3). The nation-wide average number per year of esophageal resection, Whipple procedure and gastric resection was 146, 65 and 107 respectively.

During the study period 26 different departments performed at least one esophageal resection (Table 1), 13 departments performed at least one Whipple procedure (Table 2) and 37 departments performed at least one gastric resection (Table 3). The number of procedures performed annually in each department ranged from 1 to 48, 1 to 26 and 1 to 25 for esophageal, pancreatic and gastric malignancy, respectively.

At four of the five university hospitals, esophageal resections were performed separately at departments for thoracic and surgical gastroenterology. Thus, in the study period the four departments of thoracic surgery performed a total of respective 148, 46, 232 and 26 procedures whereas the corresponding departments of surgical gastroenterology performed 125, 191, 15 and 81 procedures, respectively. At the fifth university hospital a multidisciplinary team function had been established and performed 219 procedures in the study period.

Only four departments performed more than 20 esophageal resections per year (high volume) (Table 1) whereas only one department performed more than 20 Whipple procedures (Table 2) and one more than 20 gastric resections per year (Table 3). The number of departments performing less than five procedures per year was 19, 8 and 32 respectively, for esophageal, pancreatic and gastric malignancy, respectively.

TABLE 3

Distribution of gastric resections, length of stay and hospital mortality in Denmark 1999–2004.

	1999–2004
Number of patients (total)	537
Number of departments (total)	37
Number resections per year:	
<5	32
5–20	4
>20	1
Mean length of stay (days)	18
Hospital mortality ((%) 95%CI)	8.2 (6.0–10.4)
Hospital mortality in relation to resections per year / department:	
<5	8.2 (5.0–12.7)
5–20	8.0 (4.6–12.2)
>20	8.4 (3.7–15.9)

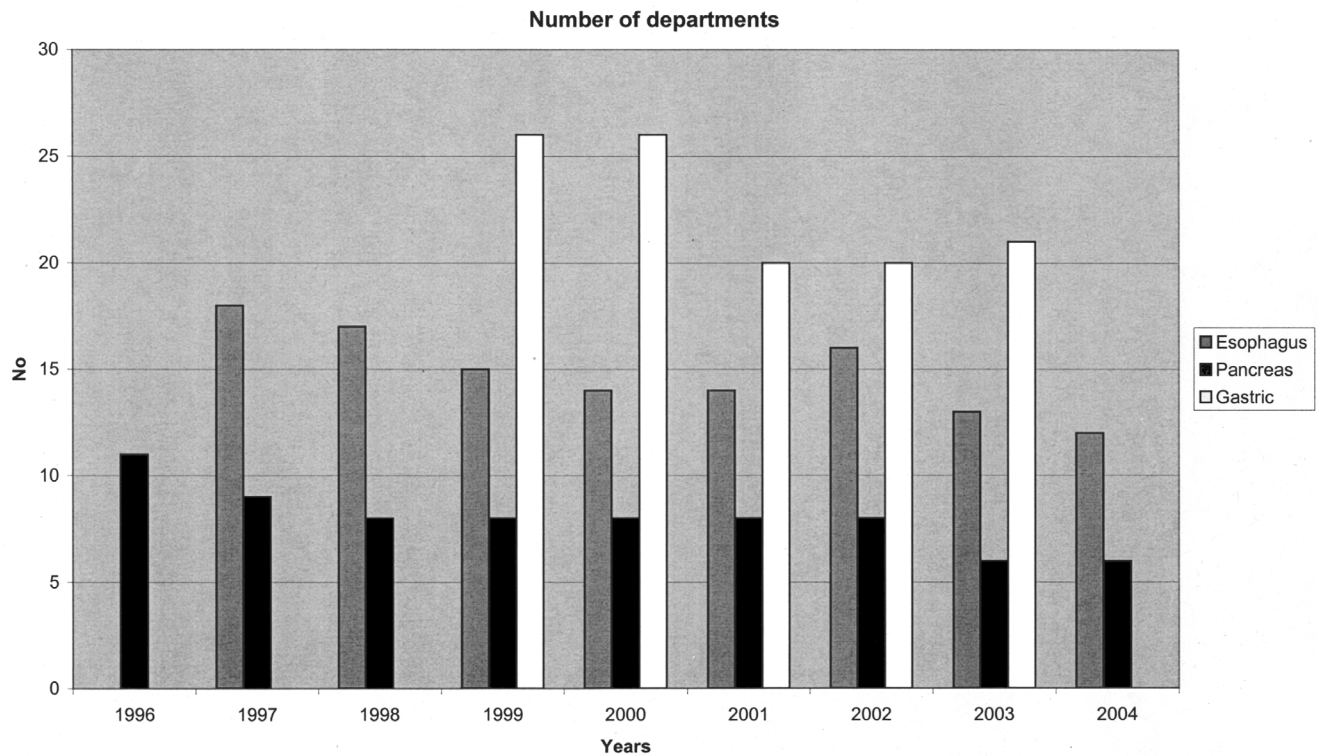


Fig. 1. Number of departments performing esophagectomies, pancreaticoduodenectomies and gastric resections in the period of January 1 1996 to December 31 2004.

phageal, pancreatic and gastric resections (Table 1–3). The distribution of the number of operating departments for all procedures during the study periods is shown in Fig. 1.

The overall mean length of stay (LOS) was 22, 24 and 18 days for esophageal, pancreatic and gastric resections, respectively, without change over time in the study period (Table 1–3).

The overall hospital mortality rate from 1997 to 2004 for patients undergoing esophageal resections was 8.6% with no difference over time (Table 1). The large difference in numbers of procedures performed in each department precludes between hospitals statistical analysis of mortality. Despite trends for lower mortality in high volume departments. A similar pattern was seen for Whipple's procedure with an overall mortality rate of 8.9% (Table 2). For gastric resections the hospital mortality rate was 8.2% and with nearly identical rates at all departments (Table 3). Only slight variations in the hospital mortality were observed during the study period for all procedures (Fig. 2).

DISCUSSION

This nationwide Danish study of patients undergoing operation for three malignancies in the upper gastrointestinal tract during the period of 1996 to 2004 showed a long postoperative hospital stay and high mortality without improvements over time. Furthermore, the study showed that these complex surgeries were performed in many departments and with a

relatively low frequency, and failing to demonstrate a clear effect of volume on outcome for oesophageal, pancreatic and gastric resection.

It was remarkable that up to 32 different departments performed less than five procedures per year. In Denmark The National Board of Health in agreement with The Danish Surgical Society already in 1996 recommended that gastrectomy, esophageal resection and pancreaticoduodenectomy should be performed only at five defined university departments. Thus, the study demonstrates that these recommendations were not been followed and that no actions had been taken to change practice, as also observed in Holland for pancreatic resection (8).

We observed no significant differences in mortality between high and low volume departments probably explained by the fact that a "high" volume department may be considered as "median" volume department and that the small numbers do not allow valid statistical analysis. Thus, the total number of operations even in "high" volume centres is not comparable to high volume centres reporting significantly lower mortality (1–8, 14–16). Also, the previously demonstrated surgeon volume-mortality relationship (3) cannot be commented on since surgeon specific data were not available. However, the structure in Danish surgical departments with several senior surgeons performing these operations suggest that the current organisation will not provide real high surgeon and hospital volume centres. Furthermore, establishment of a close team effort between surgeons, anaesthesiologists and nurses may not have been established, and such a team effort is necessary to ob-

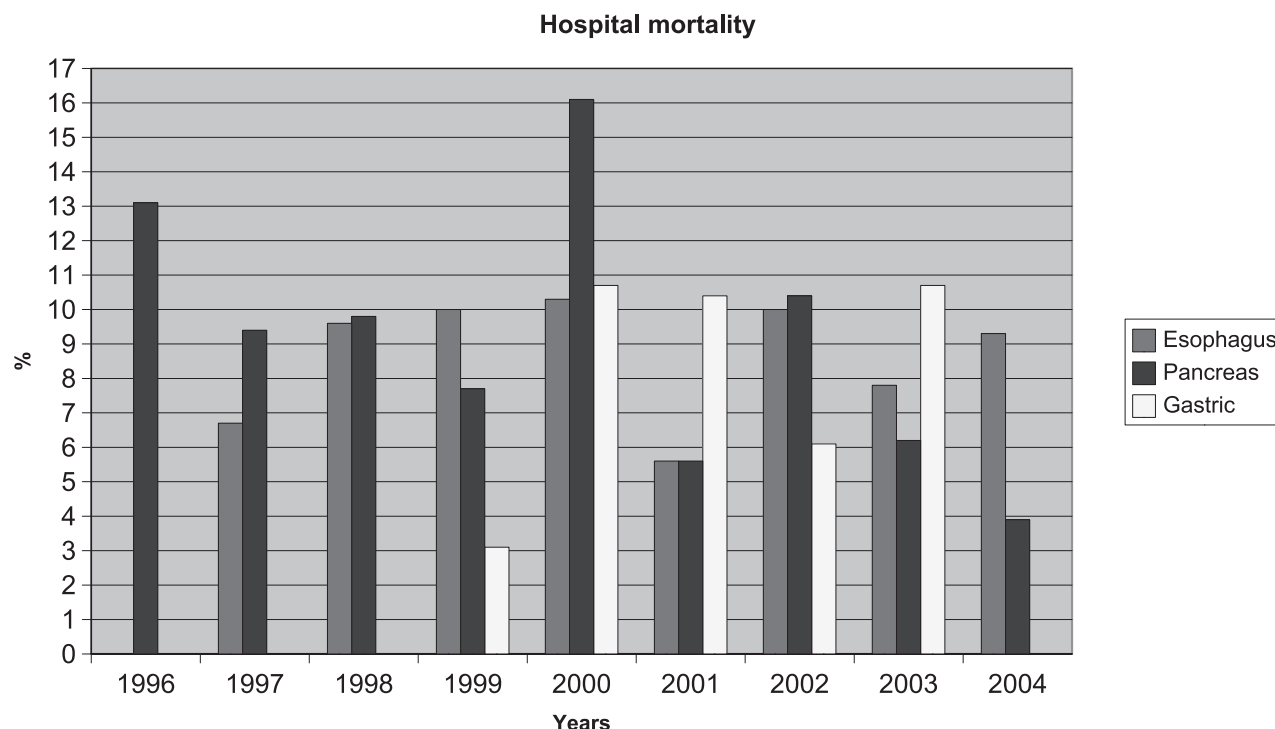


Fig. 2. Hospital mortality in percent for patients having esophagectomies, pancreaticoduodenectomies and gastric resections in the period of January 1 1996 to December 31 2004.

tain improved early outcome results (17). In only one centre a specialised surgical team with gastrointestinal and thoracic surgeons for oesophageal resections in one unit has been established with improved results (18).

The average hospital stay (LOS) was long for all procedures and did not demonstrate a decline over time. As LOS express outcome in terms of morbidity and organisation the lack of change in LOS may require a need for organisational changes regarding annual number of operations per surgeon, a multidisciplinary collaboration between surgeon, nurses and anaesthesiologists as well as adjustment of perioperative care principles to current evidence, all of which have been demonstrated to improve outcome and decrease hospital stay (17). Thus, for instance in oesophageal resection, multi-disciplinary collaboration within the concept of fast-track surgery (17) has been demonstrated to decrease mortality and reduce LOS to less than 10 days (19, 20, 21).

In conclusion, this nationwide Danish survey of the organisation and early outcome results from operations for upper gastrointestinal cancer has demonstrated an overall high mortality and long postoperative hospital stay compared to recent international experiences from specialised units. Furthermore, a number of operations were performed in many medium to low volume hospitals and not following the recommendations given by The Danish Board of Health to concentrate these operations in 5 surgical departments. These nationwide data calls for improvement by further regionalisation into 3–4 depart-

ments, establishment of multi-disciplinary postoperative care teams, interdepartmental collaboration and monitoring of the results.

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