

# Prolonged length of hospital stay in Denmark after nephrectomy

Nessn H. Azawi<sup>1</sup>, Tom Christensen<sup>1</sup>, Anette Lykke Petri<sup>2</sup> & Henrik Kehlet<sup>3</sup>

## ABSTRACT

**INTRODUCTION:** Implementation of the principles of a fast-track surgical programme resulted in a decrease in the length of hospital stay after open nephrectomies. The aim of this study was to describe the regional distribution of nephrectomies, postoperative hospital stay and mortality.

**MATERIAL AND METHODS:** This study was based on data extracted from the Danish National Patient Registry for the 2000-2009-period.

**RESULTS:** A total of 6,790 nephrectomies were performed. The mean postoperative stay and mortality decreased from 10.1 days and 2.6% during the 2000-2004-period to 8.3 days ( $p > 0.05$ ) and 1.7% ( $p < 0.05$ ) during the 2005-2009-period. A significant decrease in length of postoperative stay (6.4 versus 9.0 days;  $p < 0.05$ ) and mortality (0.9% versus 2.1%;  $p < 0.05$ ) was found between laparoscopic and open nephrectomies, respectively, during the 2005-2009-period. Nephrectomies performed by laparoscopic technique rose from 7.6% to 30.8% ( $p < 0.05$ ) and laparoscopic nephro-ureterectomies from 1.7% to 10.3% ( $p < 0.05$ ) from the 2000-2004-period to the 2005-2009-period.

**CONCLUSION:** We recommend the implementation of fast-track surgery programmes to further decrease postoperative stay and mortality. A further increase in the use of laparoscopy is warranted.

**FUNDING:** not relevant.

**TRIAL REGISTRATION:** not relevant.

Emphasis on surgical outcomes has traditionally focused on aspects of mortality and length of hospital stay (LOS). Implementation of the principles of fast-track surgical programmes has shown a decrease in hospital stay from eight days to four days after open nephrectomies [1] and to approx. two days after laparoscopic surgery [2, 3]. Furthermore, laparoscopic donor-nephrectomy can be performed with approximately 1-day's hospital stay [4]. The aim of this study was to elucidate the regional distribution of nephrectomies in Denmark during the 2000-2009-period focussing on LOS and mortality.

## MATERIAL AND METHODS

The study was based on data extracted from the National Patient Registry for the period from 1 January 2000 to 31 December 2009. All admissions with the following operation codes were included: KKAC00 (simple

nephrectomy), KKAC01 (laparoscopic nephrectomy), KKAC20 (nephro-ureterectomy), and KKAC21 (laparoscopic nephro-ureterectomy). Postoperative LOS was defined as the primary postoperative stay, including transfer to another department or hospital and any readmissions within 30 days. Mortality was death  $\leq 30$  days as recorded in the Central Population Registry (CPR). A high-activity department was defined as department had performed  $> 100$  nephrectomies/3 years in the 2000-2009-period. A low-activity department was defined as department had performed  $< 50$  nephrectomies/3 years. Trial registration was not relevant.

## Statistics

We used descriptive data, Mann-Whitney test for comparison of the available times, and Fisher's exact test for comparison of group mortality. Further, a  $p < 0.05$  was considered significant.

*Trial registration:* not relevant.

## RESULTS

During the 2000-2009-period, a total of 6,790 nephrectomies were performed in Denmark (Table 1) on 2,849 women (42%) and 3,941 men (58%). The median age was 63 years (Table 1). Operations were performed in 33 urological departments in 2000, a number which had fallen to 20 departments in 2009. At the end of 2009, six departments had performed  $> 100$  operations; nine departments 50-100 operations; and five departments  $< 50$  operations within the past three years. The operations included 3,835 (56.4%) open nephrectomies, 1,377 (20.2%) laparoscopic nephrectomies, 1,149 (17%) open nephro-ureterectomies and 429 (6.4%) laparoscopic nephro-ureterectomies. Overall, 26.6% of the operations were performed with laparoscopic techniques.

The mean mortality was 2.6% in the 2000-2004 period, decreasing to 1.7% ( $p < 0.05$ ) in 2005-2009. The total mean mortality was 2.1% in 2000-2009 (Table 2). The mean LOS was 10.1 days in 2000-2004, decreasing to 8.3 days ( $p > 0.05$ ) in the 2005-2009-period. The mean LOS was 9.1 days in 2000-2009. There was no difference in mortality or LOS between departments with high versus low activity in any periods ( $p > 0.05$ ) (Table 2). In laparoscopic versus open nephrectomies during

## ORIGINAL ARTICLE

1) Department of Urology D, Roskilde Hospital  
2) National Board of Health, Denmark  
3) Section for Surgical Pathophysiology, Rigshospitalet

Dan Med J  
2012;59(6):A4446

TABLE 1

Distribution of operations between males, females and the total number of nephrectomies per year, 2000-2009.

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Total
<i>Nephrectomies, n</i>											
Male	327	326	326	372	401	390	424	427	446	502	3,941
Female	269	272	270	269	262	287	263	328	309	320	2,849
Total	596	598	596	641	663	677	687	755	755	822	6,790
Median age, years	64.0	63.5	63.0	64.0	62.0	62.0	62.0	63.0	64.0	65.0	63.0

2005-2009, the mean LOS was 6.4 versus 9.0 days, respectively ( $p < 0.05$ ), and mortality 0.9% versus 2.1%, respectively ( $p < 0.05$ ).

In laparoscopic versus open nephro-ureterectomy, the mean LOS was 7.4 days versus 10.8 days, respectively ( $p < 0.05$ ), but with similar mortality (2.1% versus 1.9%, respectively) for the 2005-2009-period ( $p > 0.05$ ) (Table 2). In open nephrectomy versus open nephro-ureterectomy, the mean LOS was 9.8 days versus 10.9 days, respectively ( $p > 0.05$ ) and mortality was 2.5% versus 2.3%, respectively ( $p > 0.05$ ) for the 2000-2009-period (Table 2).

The same trend was found for the 2000-2004 and the 2005-2009-period. In laparoscopic nephrectomy versus laparoscopic nephro-ureterectomy, the mean LOS was 6.3 days versus 7.3 days, respectively ( $p > 0.05$ ), and the mortality was 0.9% versus 1.9%, respectively ( $p > 0.05$ ) (Table 2) for the 2000-2009-period. Nephrectomies performed by laparoscopic technique increased from 7.6% to 30.8% ( $p < 0.05$ ), while laparoscopic nephro-ureterectomies increased from 1.7% to 10.3% ( $p < 0.05$ ) from the 2000-2004 to the 2005-2009-period.

## DISCUSSION

This study of 6,790 patients who underwent nephrectomy in Denmark during the 2000-2009-period shows that operations were done in 33 departments in 2000; a number that had fallen to 20 departments at the end of 2009.

The Danish results are comparable to those reported in foreign studies regarding mortality after nephrectomies, 2.1% versus 0.6-2% [5, 6] for the 2000-2009-period. Postoperative mortality after laparoscopic procedures was lower than mortality observed after open procedures, a finding which is also comparable to the results of foreign studies [7, 8]. Patient selection for laparoscopic nephrectomy may play a role because it may be linked to tumour stage and available surgical expertise, factors that cannot be evaluated in our study.

Postoperative mortality in the 2000-2004-period was 2.6%, decreasing to 1.7% during the 2005-2009-period. This reflects the influence of specialisation at fewer departments as well as the increased use of laparoscopy; again factors that cannot be evaluated in the present study.

The lack of statistical significance for the differences between departments in relation to mortality and LOS may be due to the low number of patients and the large variability between the hospitals' results. Since 2009, the National Board of Health in Denmark has implemented a plan for specialised treatment. As of 2011, nephrectomies with malignant indication in Denmark have been centralised to 11 hospitals. As others have found a relationship between volume and mortality, this will hopefully improve national results [9].

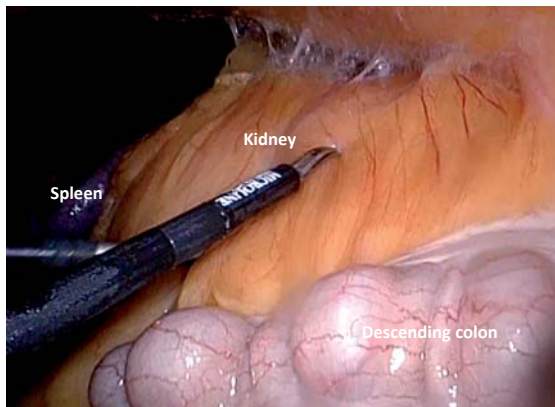
The mean LOS was 9.1 days during the 2000-2009-period, which is not comparable to foreign studies which

TABLE 2

Distribution of mortality and postoperative stay in the periods 2000-2004, 2005-2009 and 2000-2009 in departments with high, middle and low activity and for various types of nephrectomies.

	2000-2004			2005-2009			2000-2009		
	n (%)	30-day mortality, sum, %	postoperative stay, mean, days	n (%)	30-day mortality, sum, %	postoperative stay, mean, days	n (%)	30-day mortality, sum, %	postoperative stay, mean, days
<i>Hospitals with x operations within 3 years</i>									
$x > 100$	1,489 (48.2)	2.4	9.8	2,174 (58.8)	1.7	8.2	3,663 (54)	2.0	8.9
$50 \leq x \leq 100$	842 (27.2)	2.6	10.4	1,218 (33)	1.7	8.3	2,060 (30.3)	2.1	9.2
$x < 50$	763 (24.6)	2.8	10.7	304 (8.2)	1.6	8.3	1,067 (15.7)	2.4	10.0
<i>Type of surgery</i>									
KKAC00, nephrectomy	2,124 (68.7)	2.8	10.4	1,711 (46.2)	2.1*	9.0*	3,835 (56.4)	2.5	9.8
KKAC01, laparoscopic nephrectomy	236 (7.6)	0.8	5.8	1,141 (30.8)	0.9*	6.4*	1,377 (20.2)	0.9	6.3
KKAC20, nephro-ureterectomy	682 (22)	2.5	11.0	467 (12.7)	1.9	10.8*	1,149 (17)	2.3	10.9
KKAC21, laparoscopic nephro-ureterectomy	52 (1.7)	0.0	7.2	377 (10.3)	2.1	7.4*	429 (6.4)	1.9	7.3
All	3,094 (100)	2.6*	10.1	3,696 (100)	1.7*	8.3	6,790 (100)	2.1	9.1

\*)  $p < 0.05$ .



Left-sided laparoscopic nephrectomy.

report LOS averages of 2-4 days [10-12]. This difference may be due to suboptimal implementation of the fast-track principles in the Danish context, which may reduce postoperative hospital stay to four days after open nephrectomy, as previously reported in Danish studies [1].

## CONCLUSION

Mortality decreased significantly during the 2000-2009-period. However, the small decrease in LOS (from 10.1 days during 2000-2004 to 8.3 days during 2005-2009) suggests that the fast-track methodology has not been implemented [13, 14]. Hopefully, fast-track surgery programmes together with laparoscopy will lead to a further decrease in LOS as well as in mortality.

**CORRESPONDENCE:** *Nessn H. Azawi*, Urologisk Afdeling D, Roskilde Hospital, 4000 Roskilde, Denmark. nesa@regionsjaelland.dk

**ACCEPTED:** 29 March 2012

**CONFLICTS OF INTEREST:** none

**ACKNOWLEDGEMENTS:** *Steen Rasmussen*, Documentation of Public Health, National Board of Health, for creating the tables.

## LITERATURE

1. Firoozfard B, Christensen T, Kristensen JK et al. Fast-track open transperitoneal nephrectomy. *Scand J Urol Nephrol* 2003;37:305-8.
2. Recart A, Duchene D, White FP et al. Efficacy and safety of fast-track recovery strategy for patients undergoing laparoscopic nephrectomy. *J Endourol* 2005;19:1165-9.
3. Christopher SNG, Inderbir SG, Anup PR et al. Transperitoneal versus retroperitoneal laparoscopic partial nephrectomy: patient selection and perioperative outcome. *J Urol* 2005;174:846-9.
4. Kuo PC, Johanson LB, Sitzmann JV et al. Laparoscopic donor nephrectomy with a 23-hour stay. *Ann Surg* 2000;231:772-9.
5. Corman JM, Penson DF, Hur K et al. Comparison of complications after radical and partial nephrectomy: results from the national Veterans administration surgical quality improvement program. *Br J Urol* 2000;86:782-9.
6. Mejean A, Vogt B, Quazza JE et al. Mortality and morbidity after nephrectomy for renal cell carcinoma using a transperitoneal anterior subcostal incision. *Eur Urol* 1999;36:298-302.
7. Simon SD, Castle CP, Ferrigni RG et al. Complications of laparoscopic nephrectomy: the Mayo Clinic experience. *J Urol* 2004;171:1447-50.
8. Seifman BD, Montie JE, Wolf Jr S et al. Prospective comparison between hand-assisted laparoscopic and open surgical nephroureterectomy for urothelial cell carcinoma. *Urology* 2001;57:133-7.
9. Taub DA, Miller DC, Cowan JA et al. Impact of surgical volume on mortality and length of stay after nephrectomy. *Urology* 2004;63:862-7.
10. Cheema IA, Manecksha RP, Murphy M et al. Laparoscopic nephrectomy: initial experience with 120 cases. *Ir Med J* 2010;103:49-51.
11. Dunn MD, Portis AJ, Shalhav AL et al. Laparoscopic versus open nephrectomy: a 9-year experience. *J Urol* 2000;164:1153-9.
12. Desai MM, Strzempkowski B, Matin SF et al. Prospective randomized

comparison of transperitoneal versus retroperitoneal laparoscopic radical nephrectomy. *J Urol* 2005;173:38-41.

13. Kehlet H, Wilmore DW. Evidence-based surgical care and the evolution of fast-track surgery. *Ann Surg* 2008;248:189-98.

14. Kehlet H. Fast-track surgery – an update on physiological care principles to enhance recovery. *Langenbecks Arch Surg* 2011;396:585-90.