The use of urological hospital services by nonagenarians

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ABSTRACT

INTRODUCTION The super-elderly population is a small but expanding group of patients who will pose a significant challenge to future healthcare resources. A snapshot audit was completed of all emergency and elective urological nonagenarian activity in a UK general hospital, including surgical outcomes in this group of patients.

METHODS Prospective and retrospective databases and clinical records were examined to identify all patients aged 90–99 years who had patient episodes between January 2006 and August 2012. Patient outcomes were compared with those for a similar cohort of 80–89-year-olds during the same time period.

RESULTS A total of 653 nonagenarian patient episodes were identified (including 138 emergency admissions, 25 emergency surgical procedures, 71 elective surgical procedures, 173 local anaesthetic procedures and 270 outpatient visits). The in-hospital mortality rate for emergency admissions was 10%. The mean length of hospital stay was significantly longer for nonagenarians than for octogenarians (14.4 vs 6.5 days, $p < 0.00001$). The postoperative mortality rate following emergency and elective surgery was 16% and 1% for nonagenarians and octogenarians respectively.

CONCLUSIONS Nonagenarian patients often have complex medical co-morbidities and challenging social circumstances that contribute to delayed recovery from acute illness and surgery as well as long periods of hospitalisation. Adopting a multidisciplinary approach with formal input from specialist geriatric surgical services may improve patient outcomes and allow patients to be discharged to their former places of residence.

KEYWORDS

Nonagenarian – Elderly – Urology – Surgery – Emergency – Elective

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The super-elderly population is a small but expanding group of patients. A third of babies born in the UK in 2012 are predicted to live to be 100 years old.¹ UK men and women aged 65 years in 2010 are forecast to live to 83 years and 86 years respectively,² with 95,000 people aged 65 years in 2012 expected to celebrate their 100th birthday in 2047.¹ This group of patients is likely to impact significantly on healthcare services in the future. Likewise, in the US, a similar population expansion is predicted. The resident US combined male and female population aged 85 years and over is projected to increase from 6.5 million (2.0%) in 2015 to 19.0 million (4.8%) in 2050, and the population aged 100 years and over will rise from 72,000 (0.02%) in 2015 to 387,000 (0.1%) in 2050.³

Many urological conditions are associated with increasing age and it is inevitable that the urological workload for elderly patients will rise. Elective and emergency surgery in super-elderly patients involves higher risks for this generally co-morbid population. Studies on surgical outcomes for nonagenarians are limited. Pelavski *et al* reported a 29% in-hospital mortality rate after emergency non-trauma surgery in nonagenarians.⁴ In another study looking at

1,063 surgical procedures in nonagenarians, 84 elective urological procedures were performed with a 30-day mortality rate of 3.6%.⁵ Additionally, non-operative emergency management of elderly patients consumes significant medical resources. This study examined hospital databases and clinical information to gain a snapshot audit of urological activity in nonagenarians in a UK district general hospital.

Methods

Records from January 2006 to August 2012 were used to determine the extent of urological emergency admissions, outpatient clinic attendances, elective and emergency theatre activity, and cancer multidisciplinary team discussions. A prospectively updated record of emergency urological admissions was used to identify nonagenarian patients who were admitted acutely to a general urology unit. The database was used to compare the nonagenarian admissions with a similar cohort of patients aged 80–89 years. Outpatient data and information on elective theatre activity were obtained retrospectively from electronic and paper patient records. This study was approved by the hospital

Table 1 Number of emergency nonagenarian admissions

Specialty	2006	2007	2008	2009	2010	2011	2012*	Total
Urology	22	17	16	11	15	41	16	138
Elderly care medicine	976	1,014	1,038	848	974	1,078	727	6,655
Accident and emergency	267	99	145	158	493	647	331	2,140
General medicine	67	88	141	201	131	89	92	809
Orthopaedics	97	87	78	105	92	118	77	654
General surgery	37	46	34	37	41	71	37	303
Otolaryngology	16	6	7	13	10	13	6	71
Gynaecology	3	4	4	5	3	5	5	29
Total	1,485	1,361	1,463	1,378	1,759	2,062	1,291	10,799

*data for January to August

research, development and audit office, and ethical approval was not required.

Results

Emergency admissions

Emergency admissions to the urology unit were recorded for 141 patients aged over 90 years. Three patients aged 100 years were excluded from the analysis, leaving 138 nonagenarian admissions. This constituted 1.3% of all hospital admissions for nonagenarians during this period and 11.5% of the 1,195 nonagenarian admissions for surgical specialties (urology, orthopaedics, general surgery, otolaryngology and gynaecology) (Table 1). The mean age was 92.5 years and the male-to-female ratio was 6:1. Seventeen patients had more than one emergency urology admission during the study period (2 admissions $n=14$, 3 admissions $n=1$, 4 admissions $n=1$, 5 admissions $n=1$).

The most common presentation was haematuria ($n=57$, 41%) (Table 2). Of the haematuria cases, 25 (40%) were related to long-term catheterisation. A new urological malignancy was diagnosed in six patients (11%) presenting with haematuria. Forty-eight patients (35%) presented with urinary retention. Fourteen of these voided successfully after catheter removal (4 inpatient, 10 outpatient) and six had a subsequent planned transurethral resection of the prostate (TURP). The remaining 28 patients failed to void and were not considered suitable for further urological intervention. Seventeen admissions (12%) were for mechanical catheter related problems (eg blocked or dislodged catheters). Forty-one patients (29%) had a urological malignancy (prostate $n=25$, bladder $n=14$, upper tract urothelial $n=2$). A new cancer diagnosis were made during the acute admission for nine patients (bladder $n=6$, prostate $n=2$, upper tract urothelial $n=1$).

The length of hospital stay ranged from 1 day to 96 days (Fig 1). The mean length of stay was 14.4 days (standard deviation [SD]: 17.1 days, median: 7 days) compared with 6.5 days (SD: 7.0 days, median: 5 days, range: 1–42 days)

Table 2 Diagnoses for nonagenarian emergency admissions and outpatient consultations

Diagnosis	Male	Female	Total
<i>Emergency admissions</i>			
Haematuria	44	13	57
Urinary retention	43	5	48
Mechanical catheter problems	16	1	17
Urinary tract infection	4	2	6
Loin pain	2	1	3
Unwell related to urological malignancy	2	0	2
Epididymitis	2	–	2
Incontinence	1	0	1
Scrotal haematoma	1	–	1
Bleeding following circumcision	1	–	1
Total	116	22	138
<i>Outpatient consultations</i>			
Lower urinary tract symptoms / incontinence	48	16	64
Prostate cancer diagnosis / follow-up	42	–	42
Haematuria	28	12	40
Bladder cancer diagnosis / follow-up	17	5	22
Urinary tract infection	12	6	18
Prostate specific antigen surveillance	9	–	9
Renal tumour diagnosis, surveillance	3	2	5
Ureteric stones	1	1	2
Total	160	42	202

Figure 1 Length of stay for emergency nonagenarian hospital admissions

for a similar cohort of 110 patients aged 80–89 years who required emergency admissions at the same unit during the same time period ($p < 0.00001$, Student's *t*-test). The mean length of stay for all adult emergency admissions taken from a sample of 150 consecutive admissions during the same period was 3.8 days (SD: 4.9 days, median: 2 days, range: 0–40 days). Nonagenarians with a urological cancer diagnosis had longer hospital stays, with a mean of 17.0 days (SD: 16.1 days) compared with 12.6 days (SD: 18.0 days) for those with non-cancer diagnoses but this did not reach statistical significance ($p = 0.109$).

The overall in-hospital mortality rate was 10% for emergency admissions ($n = 14$). Causes of death are shown in Table 3. A further 2 patients died within 28 days of discharge. Of the 138 emergency admissions, 32 patients (23%) were readmitted to hospital within 28 days of discharge (5 had ongoing urological problems, 28 presented with other medical or surgical problems). Furthermore, 69 patients (49%) had at least 1 emergency admission within 3 months of discharge after their emergency urology admission and 60 patients (43%) had at least 1 emergency admission under another medical or surgical specialty in the 3 months preceding their emergency urology admission.

Emergency surgery

Of the 138 emergency admissions, 17 patients required emergency operations during their admission. These included transurethral resection of a bladder tumour (TURBT) ($n = 8$), cystoscopy and suprapubic catheter insertion ($n = 2$), cystoscopy and bladder washout ($n = 2$), TURP ($n = 1$), ureteric stent insertion ($n = 1$), cystoscopy assisted urethral catheter insertion ($n = 1$), ureteroscopic stone removal

($n = 1$) and debridement of Fournier's gangrene ($n = 1$). Additionally, nine nonagenarians were identified who were admitted under another specialty and required emergency urological surgery during that admission. These operations comprised TURBT ($n = 2$), optical urethrotomy ($n = 2$), cystoscopy and bladder washout ($n = 1$), diagnostic cystoscopy ($n = 1$), ureteric stent insertion ($n = 1$), cystoscopy assisted urethral catheter insertion ($n = 1$) and open cystolithotomy ($n = 1$).

The mean length of stay for nonagenarians admitted under urology who underwent emergency surgery was 23.8 days (SD: 26.9 days). The mean length of stay for all adults admitted under urology who had emergency surgery (taken from a sample of 150 consecutive cases during the same period) was 6.7 days (SD: 8.2 days, median: 4 days, range: 0–42 days). Four of the twenty-five nonagenarians who underwent emergency urological surgery (16%) died during the acute admission (Table 3). One 90-year-old who was admitted with catheter related problems underwent TURP during his admission and experienced serious post-operative morbidity with urinary and chest sepsis requiring intensive care and a prolonged hospital stay of 24 days.

Elective activity

Seventy-one patients underwent elective surgical procedures (Table 4). Sixty-three cases (89%) were dealt with as inpatients with eight operations (11%) in the day surgery unit. General anaesthesia was used in 44 cases (62%), spinal anaesthesia in 16 (23%) and local anaesthesia with or without sedation in 11 (15%). Ten patients (14%) were ASA grade 1, 35 patients (49%) were ASA grade 2 and 26 patients (37%) were ASA grade 3. One hospital mortality (Table 3) was recorded (1.4%) for a 91-year-old following

Table 3 In-hospital mortality information for emergency nonagenarian admissions including both emergency and elective surgical cases

Age	Reason for admission	Diagnosis	Management	Cause of death	Length of stay
98	Haematuria	Known advanced prostate cancer	Palliation	Metastatic prostate cancer	14 days
97	Urinary retention	Benign prostatic hyperplasia	Catheterisation and antibiotics	Urinary sepsis	81 days
96	Haematuria	New bladder tumour	Palliation	Metastatic bladder cancer	7 days
96	Failed catheter change	Long-term catheter for outflow obstruction	Catheterisation	Urinary sepsis	4 days
95	Scrotal swelling	Fournier's gangrene	Debridement x4 under general anaesthesia	Sepsis, multiorgan failure	45 days
95	Fall and urinary retention	Urethral stricture	Urethral dilation and catheter insertion under general anaesthesia	Myocardial infarction	12 days
94	Haematuria	New bladder tumour	Palliation	Metastatic bladder cancer	23 days
93	Haematuria	Known prostate cancer	Palliation	Metastatic prostate cancer	15 days
92	Urinary retention	Benign prostatic hyperplasia	Catheterisation	Chest infection	25 days
91	Mechanical catheter problem	Long-term catheter and ureteric stent	Catheter change, antibiotics	Urinary sepsis	25 days
90	Haematuria	Fall	Observation	Frailty of old age	80 days
90	Urinary retention	High pressure retention	Catheterisation	Obstructive renal failure	10 days
90	Scrotal haematoma	Trauma	Conservative management	Frailty of old age	9 days
90	Urinary retention	Benign prostatic hyperplasia	Catheterisation	Advanced lung cancer	28 days
91*	Diarrhoea	New bladder tumour	TURBT under spinal anaesthesia	Pneumonia	45 days
91*	Falls	Ureteric stone	Stent insertion under local anaesthesia	Urinary sepsis	15 days
91	Elective TURP	Benign prostatic hyperplasia	TURP under spinal anaesthesia	Myocardial infarction	17 days

TURBT = transurethral resection of bladder tumour; TURP = transurethral resection of the prostate
 *admitted under the geriatric physicians and required emergency urological surgery

elective TURP under spinal anaesthesia with subsequent cardiopulmonary complications. This patient died on the 17th postoperative day of an acute cardiac event. Six patients (8%) died within 28 days of hospital discharge. In-hospital mortality was similar to that for 80–89-year-olds (2%).

The overall mean length of stay for our elective cohort was 5.0 days (SD: 4.1 days, median: 3 days, range: 1–37 days) compared with 4.1 days (SD: 3.3 days, range: 1–21 days) for a cohort of 85–89-year-old patients ($n=126$) undergoing similar elective procedures during the same time period ($p=0.017$). Readmission to hospital within 28 days of discharge occurred in 13 nonagenarian patients (18%) compared with 10 patients (8%) aged 85–89 years.

Overall, 173 local anaesthetic procedures were carried out in the endoscopy unit, including 143 flexible cystoscopies for bladder cancer diagnosis/follow-up ($n=66$), laser ablation of small bladder tumours ($n=9$), cystoscopic catheterisation ($n=4$) and diagnostic procedures for other urological symptoms ($n=64$). Four transrectal ultrasonography

guided biopsies were performed for prostate cancer diagnosis with no subsequent episodes of sepsis or urinary retention. Twenty-six routine catheter changes were performed.

For outpatient consultations, 270 visits were recorded for nonagenarians (220 men, 50 women). Complete clinical records of outpatient consultations were available for 202 patients. Table 2 shows the clinical diagnoses for patients seen in the outpatient clinic. For the patients with full clinical details available, 69 (34%) of the consultations were for cancer diagnosis or follow-up. Seven patients required cancer multidisciplinary team discussions regarding cancer management. Palliative radiotherapy was offered to three patients (prostate cancer $n=2$, bladder cancer $n=1$).

Discussion

The use of health resources by elderly patients is likely to increase with the growth of this patient group. This will present greater healthcare challenges to society. To our

Procedure	Total (M:F)	ASA grade				Mean LOS	Mortality
		1	2	3	4		
Cystoscopy +/- biopsy	22 (14:8)	1	14	7	0	4 days	0
TURP	13	2	6	5	0	10 days	1
TURBT	10 (6:4)	1	4	5	0	4 days	0
Stent procedure	9 (3:6)	3	4	2	0	3 days	0
Penile / scrotal procedure	6	1	2	3	0	4 days	0
Cystoscopic catheterisation	3 (3:0)	1	1	1	0	6 days	0
Urethrotomy / dilation	3 (1:2)	1	1	1	0	2 days	0
Nephrectomy	2 (0:2)	0	1	1	0	37 days	0
Cystolitholapaxy	2 (2:0)	0	1	1	0	19 days	0
Intravesical Botox® injection	1 (0:1)	0	1	0	0	2 days	0
Total	71 (48:23)	10	35	26	0	5 days (SD: 4.1 days)	1

ASA = American Society of Anesthesiologists; LOS = length of stay; TURP = transurethral resection of the prostate; TURBT = transurethral resection of bladder tumour; SD = standard deviation

knowledge, this is the first focused study of urological activity in nonagenarian patients. A total of 653 patient contact episodes (emergency, elective, inpatient and outpatient) for nonagenarians were identified during the study period. Regardless of the diagnosis at admission or whether the admission was as an emergency or elective, nonagenarian patients in the cohort described here had a longer mean hospital stay than patients aged 80–89 years (14.4 vs 6.5 days). For patients who required emergency surgery, the mean hospital stay was greater (23.8 days).

Extended hospital stays reflect the often complex co-morbidities, challenging social circumstances and increased physiological demands of recovering from acute illness in frail patients with reduced physiological reserves. Nonagenarians with acute urological conditions had a 10% risk of in-hospital death. Iwata *et al* followed 275 nonagenarian emergency department attendances and 179 subsequent hospital admissions, and reported a 19.6% in-hospital mortality rate across all medical and surgical specialties.⁶ The mean hospital stay was 23 days for nonagenarians compared with 16 days for younger patients.

In our study population, patients presenting with mechanical catheter problems such as blocked or dislodged catheters were frequently admitted to hospital. These problems can usually be managed with simple manipulations and subsequent discharge. The use of dedicated outpatient/flexible cystoscopy units could prevent hospital admissions ever occurring. However, in the nonagenarian population, an inpatient stay was recorded for 17 patients who presented with catheter problems, with subsequent hospital stays of up to 7 days to manage copresenting medical or social issues. It is fairly common for elderly patients brought to hospital for apparent minor conditions

to reveal other significant medical or social problems that need to be addressed. It is unlikely that an acute urological ward is the optimal setting for these problems to be resolved and this may contribute to the extended inpatient stays.

It is not surprising that the outcomes of emergency surgery in the elderly are poorer than for elective procedures. For many elderly patients, emergency surgery represents a significant life event after which many are unable to return to their previous level of independence or even return home.⁷

Orthopaedic surgeons have much experience in operating on elderly patients. The published mortality for nonagenarians undergoing emergency hip surgery is good compared with other surgical specialties. In a 2014 study by Tay *et al*, out of 56 nonagenarians presenting with hip fractures who underwent surgery, only 1 in-hospital postoperative death was reported (2%) with a 1-year mortality rate of 12%.⁸ The majority of patients in the orthopaedic group were either ASA grade 3 (43%) or ASA grade 2 (52%), with only 5% classed as ASA grade 1. Our in-hospital mortality rate for emergency urological surgery of 18% is more in keeping with data published in 2011 on emergency non-trauma surgery in nonagenarians, where the in-hospital mortality rate was 29% for general, vascular and urological surgery combined.⁴ Of the 102 operations carried out, 11 were for urological problems and 5 (45%) of these patients died postoperatively.

When analysing outcomes of elective procedures, we face the inherent bias of patient selection. The in-hospital mortality rate for the 71 elective procedures in nonagenarian patients in our study was 1.4%. It is likely that this represents a well selected group of patients with good

physiological reserve and few co-morbidities undergoing mostly minor surgical procedures; 63% of the patients were classed as ASA grade 1 or 2.

The largest study to date on nonagenarian surgery reported on 795 patients aged over 90 years between 1975 and 1985.⁵ Of the 1,063 operations carried out, the overall serious morbidity rate within 48 hours of surgery was 9.4% and the overall mortality rate was 1.6%. The 30-day mortality rate was 8.4%. Surgery involving the mouth, nose or pharynx had the highest mortality. There were 84 urological procedures performed with a 30-day mortality rate of 3.6%. The recorded one-year survival of nonagenarians undergoing surgery was significantly worse than for a comparative group of nonagenarians in the general public. However, those surviving to two years after surgery had similar long-term survival.

Our study has highlighted a high rate of hospital admissions both before and after emergency presentations with acute urological problems. In addition to the complex needs of elderly patients, the high readmission rate may be attributed to inadequate hospital rehabilitation and social discharge planning.

The orthogeriatric model of care⁹ has been practised since the 1950s with day-to-day input from doctors and nurses trained in geriatric medicine. A Cochrane review suggested that coordinated multidisciplinary care in elderly patients with hip fractures improved outcomes.¹⁰ A number of different care models exist for the care of elderly orthopaedic patients including regular liaison visits to orthopaedic wards by dedicated geriatric teams and the transfer of care to geriatricians after the immediate perioperative care has been completed by the surgical teams.

The model of care that is supported by the British Geriatric Society (BGS) is one of joint care between orthopaedic surgeons and geriatricians on dedicated orthogeriatric wards facilitating collaboration and communication between specialists and minimising disruptive ward moves for patients. In addition to multidisciplinary postoperative care, the BGS also advocates the preoperative assessment of elderly patients using a joint care model. The success of the well established collaboration between surgeons and physicians in the orthopaedic setting should be considered for other surgical specialties. Our study has shown significant urological activity in patients aged 90 years and over, which represents 11.5% of total nonagenarian activity in our hospital for all surgical specialties.

The benefits of a multidisciplinary model for surgical care in elderly patients are numerous.¹¹ Patients would have better perioperative management including preoperative optimisation enhanced postoperative care with safe pain management and specialist management of postoperative delirium. There would be appropriate discharge planning from the time of admission, improved access to community services, and liaison with relatives and carers. Multidisciplinary involvement would also maximise the rehabilitation potential with the aim of allowing elderly patients to return to their previous place of residence. Furthermore, geriatricians would be able to advise on the

complex ethical issues that surround end-of-life care and establishing ceilings of care for elderly patients. Although the costs of setting up a dedicated surgical geriatric service might be high, the potential secondary savings in terms of reduced hospital stay in acute surgical beds, reduced perioperative morbidity and lower readmission rates would possibly offset these costs.

Conclusions

This study has identified significant hospital activity in patients in their 90s with urological problems, allowing us to have a better understanding of the types of problems that will become more prevalent in the future. These data may help urologists and hospital managers when planning services and resource allocation. A national snapshot audit of nonagenarian activity would further our knowledge on the extent of this issue, which is likely to be of increasing importance in the future. Finally, increasing the collaboration between surgeons and elderly care physicians and the involvement of multidisciplinary teams may reduce the burden on healthcare resources, reduce the length of hospital stay and improve patient outcomes.

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