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As the Population is Aging the Surgical Care Model Needs Refreshment: Implementation of a Vasculogeriatric Service for Vascular Surgical Patients in Australia

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Abstract

Introduction: Vascular surgical patients are elderly with multiple, significant co-morbidities requiring multi- specialist management. Optimal perioperative inpatient medical management may have a positive impact on timely discharge. This study aims to investigate whether an integrated geriatric service in a vascular surgical department reduces length of stay and cost.

Methods: A geriatric service was created as an integral part of a Vascular Surgical Unit in a tertiary state referral center. In a retrospective cohort study design patient data was investigated six months prior to installment of the service and the six months after.

Results: Total number of patients admitted was 669 (300 before, and 369 after institution of the vasculogeiatric service. Patients with multiple admissions were excluded resulting in a patient volume of 497. A significant reduction of length of stay was found after the introduction of the vascular geriatric service (p= 0.003). This difference remains true when sub analysed for gender (p= 0.014), admission type (p< 0.001) and age (p= 0.012).

Conclusion: In this pilot study the institution of a vasculogeriatric service lead to a significant reduction in LOS. The authors highly recommend this model of care, however specific benefits in-patient care and impact on mortality needs evaluation in further studies.

Keywords: Vascular surgical procedures; geriatric medicine; Patient care; Length of stay gerontology; Healthcare economics

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Introduction

Rising healthcare costs and progressively limited access to financial resources for individual hospitals significantly influence daily medical practice [1]. In an effort to reduce cost socio-economic factors are rapidly becoming an essential consideration in patient management. New pathways to reduce the lengths of stay without compromising medical care are desirable.

Vascular surgical patients are generally elderly and have multiple, significant co-morbidities, which impact their morbidity and mortality from vascular surgical intervention [2]. Management of many of these co-morbidities is outside the expertise of the vascular surgeon and requires input from mainly medical specialties. These multiple referral processes create delays in care pathways, which become inefficient consequently delaying discharge to home, rehabilitation or another care facility. As a result the length of stay increases negatively impacting on monetary cost, patient turnover and availability of specialized tertiary service access.

In an in-hospital audit of vascular surgical inpatients at our institution, the authors determined that patients waited an average of 8 days until all non-vascular specialist opinions, investigations and management plans were obtained (unpublished data). In an effort to reduce any delays and reduce the Length of Stay (LOS) a dedicated geriatric specialist service was embedded into the vascular department. Hence, in addition to the surgical rounds a dedicated geriatric ward round was installed as part of the daily routine addressing medical and social issues.

The aim of this pilot study was to determine whether the introduction of an integrated geriatric service is feasible and has a positive impact on LOS for the vascular surgical patient.

Methods

As this study was a retrospective analysis of a current hospital practice no approval from an

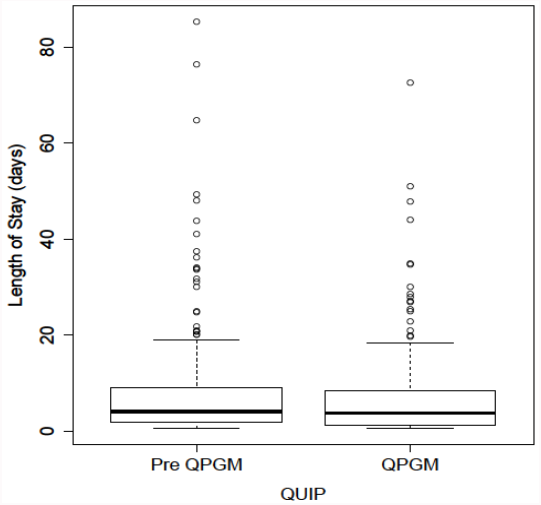

Figure 1: Boxplot of LOS separated by QUIP.

Table 1: Admission code categories.

Admission Code	Type
1	Elective via waitlist
2	Elective direct to ward
3	Emergency via the Emergency Department
4	Emergency via direct admission

ethics committee had to be obtained. Sir Charles Gairdner Hospital is a large teaching hospital providing a tertiary referral service for Western Australia. With the support of the Western Australian Health Service executive as part of the Quality Improvement Program (QUIP) a Quality Program Geriatric Medicine (QPGM) was initiated. A vasculogeriatric (VG) service was established in the form of a consultant (0.3 Full Time Equivalents (FTE)) and registrar (0.5 FTE) who would work as part of the vascular surgical staff to optimize the management of vascular surgical patients.

From 1st June 2012 all patients admitted under the care of vascular surgery were jointly managed with the VG service. The VG team attended the weekly Grand Round, the weekly Multidisciplinary Meeting and the weekly Joint Vascular Surgical / Radiology Meetings in order to provide appropriate input into treatment goals, and understand the vascular surgical management plans.

In addition, the VG registrar performed daily ward rounds and the VG consultant provided 3 rounds weekly. The surgical team made surgical and related decisions, whereas medical management issues were preferentially managed by the VG team. There was close collaboration at all times and a junior member of the vascular surgical team would always accompany the VG registrar on ward rounds.

A 12 months period from December 2011 until December 2012 was investigated. Hospital data on length of stay of all patients admitted under vascular surgery was collected from The Open Patient Administrating System (TOPAS) for the six months prior (Dec 2011-May 2012; pre QPGM)) and the six months during the VG service (June 2012-Nov 2012; QPGM)). The data was analyzedfor the relationship between length of stay (days) (LOS) and the following variables: Quip (Pre QPGM/QPGM), patient age, Sex and type of admission (Table 1) with emergency admissions pooled into one subgroup. Summary statistics including mean, standard deviation, minimum, maximum, median and interquartile range (IQR) are provided for all continuous variables. Descriptive plots are provided for relationships of interest. A Generalised Additive Models for Location Scale and Shape (GAMLSS) model was used to analyse length of stay and determine the effect of QPGM on length of stay. Data were analysed using the R environment for statistical computing [3].

Results

The number of patients admitted under the vascular service during the investigated period was 670. All individuals with multiple episodes of care were removed with the exception of their first admission (as determined from the admission year and month). This reduced the sample size from 670 to 497. One individual was also removed during the model fitting process as it was violating the underlying assumptions. Summary statistics have been provided with this individual removed. Table 2 contains summary statistics for length of stay (LOS) separated by QUIP group for all variables. A significant difference in LOS between QPGM and pre-QPGM (p-value = 0.003) with a raw difference of approximately 1.1 days is observed. This is also graphically demonstrated in the Box Plot separated by QUIP (Figure 1). Sex was also found to be significant (p-value = 0.014) with female staying an average of 1.3 days less.

Table 2: Summary statistics for length of stay (LOS) separated by QUIP group for sex, age and admission category.

Variable	Categorisation	N	Mean	Std Dev	Min	Max	Median	IQR	P-value
QUIP	QPGM	250	6.882	9.041	0.665	72.575	3.756	7.342	0.003
	Pre-QPGM	246	7.965	11.554	0.62	85.241	4.074	7.272	
Sex	Female	171	6.540	8.458	0.620	3.074	7.050	48.093	0.014
	Male	325	7.881	11.227	0.699	4.125	7.401	85.241	
Age Groups	50-54	32	8.652	12.260	0.941	2.927	8.934	49.194	0.012
	55-64	99	9.787	15.196	0.886	4.639	9.528	85.241	
	65-74	159	6.642	9.112	0.620	3.342	6.933	76.271	
	75-84	139	6.555	7.773	0.665	3.431	6.289	51.024	
	85-94	61	6.310	5.412	1.027	4.556	7.842	24.913	
	95-104	6	13.644	17.816	2.000	5.673	15.053	48.093	
Admission Code	1	241	3.004	4.254	0.620	1.765	1.624	37.349	<0.001
	2	13	18.794	14.444	1.427	16.914	15.577	43.923	
	3/4	242	11.205	12.308	0.665	7.662	9.144	85.241	

Table 3: Summary statistics for sex, age groups and admission codes separated by QUIP.

Variable	Time Period	Categorisation	N	Mean	Std Dev	Min	Max	Median	IQR
Sex	QPGM	Female	85	5.863	7.215	0.665	43.923	3.076	6.929
		Male	165	7.407	9.83	0.866	72.575	3.985	7.584
	Pre QPGM	Female	86	7.21	9.525	0.62	48.093	2.973	7.283
		Male	160	8.371	12.519	0.699	85.241	4.449	7.34
Age Groups	QPGM	50-54	18	4.763	7.548	0.941	26.888	1.33	2.748
		55-64	57	9.826	13.435	0.886	72.575	5.789	9.643
		65-74	76	5.971	6.715	0.918	34.74	3.446	6.414
		75-84	67	6.291	8.122	0.665	51.024	3.232	6.892
		85-94	27	6.133	5.19	1.088	17.863	3.525	8.902
		95-104	5	6.755	6.383	2	17.74	5.036	3.622
	Pre QPGM	50-54	14	13.653	15.364	1.024	49.194	7.242	16.794
		55-64	42	9.734	17.475	0.956	85.241	3.185	7.68
		65-74	83	7.257	10.861	0.62	76.271	3.342	6.707
		75-84	72	6.801	7.483	0.699	33.963	4.003	6.252
		85-94	34	6.451	5.656	1.027	24.913	5.582	7.908
		95-104	1	48.093	.	48.093	48.093	48.093	0
Admission Code	QPGM	1	113	2.752	4.297	0.886	30.094	1.19	1.076
		2	8	16.853	12.549	4.765	43.923	14.861	12.895
		3/4	129	9.881	10.193	0.665	72.575	6.962	8.926
	Pre QPGM	1	128	3.227	4.22	0.62	37.349	1.845	2.188
		2	5	21.9	18.185	1.427	43.815	20.812	29.053
		3/4	113	12.716	14.244	0.699	85.241	8.13	10.803

Looking at the raw data the difference from Pre-QPGM to QPGM is larger for males, whereas for females, though the mean decreased, the median stayed approximately the same (Table 3). Age (continuous) and admission code were also found to be significant (p-value 0.012 and <0.001 respectively). Table 3 provides the summary statistics for sex, age groups and admission codes separated by QUIP. There was a reduction in median LOS from Pre QPGM to QPGM for all age groups except 55-64 and 65-74. A decrease was also observed in the median LOS for all 3 admission code groups - with the most noticeable difference being for admission code group 2 (decrease of 6 days).

Discussion

Vascular surgical patients have significant co-morbid conditions related to risk factors for peripheral vascular disease such as cardiac disease, smoking-related lung disease, hypertension, hypercholesterolemia, diabetes and renal impairment. Many have cognitive and functional impairments, particularly of mobility. In a population with diminished physiological and psychological reserve, foot wounds, lower limb surgery and amputation whether major or minor, all impact on mobility and morbidity further. This ordinarily creates delays in care pathways in vascular surgery, extending in-patient stay, increasing time to rehabilitation, and increasing cost. The management of medical conditions of older people is traditionally the field of expertise of medical specialists. A geriatrician is able to undertake the appropriate management of most medical problems and facilitate the involvement of other specialists as needed. Furthermore they have expertise in providing a holistic approach and streamline service for their social requirements. This reduces the need for many inter-specialty referrals and potential delayed discharge.

Our cohort study showed a significant reduction in length of stay after the institution of an integrated geriatric service. This effect was true for both genders and all age groups with the exception of younger patients (55-74). It was also true for all admission categories, whether elective or emergency, which implies a general applicability regardless of pathology. Although the exact mechanisms have not been investigated in detail in this study, there are various aspects that explain the observed effect. The timely preoperative assessment of inpatients requiring urgent treatment will be improved. Early institution of cardio respiratory treatments will medically optimize the patient. This will reduce the need for further non-vascular investigations prior to surgery. Prior geriatric assessment may also increase the acceptance for the necessity of additional consultations by other relevant medical specialties. Although it seems logical that quick preoperative patient optimization and elimination of investigative and surgical delays will reduce perioperative morbidity and mortality rates further studies are required. Similar advantages apply to the management of incidental pathologies and geriatric syndromes such as dementia, delirium, falls, incontinence and poly pharmacy. These can be undertaken as an inpatient ensuring an appropriate follow-up. In fact the American College of Surgeons and the American Geriatric Society have published joint guidelines in the National Surgical Quality Improvement Program (NSQIP) in an effort to achieve structured geriatric assessment of preoperative elderly patients [4].

Many vascular surgical patients require a period of rehabilitation prior to discharge. Regularly they are rejected for reasons relating to unresolved medical problems. A geriatrician will ensure that medical issues are addressed, management plans established and

that there are reasonable rehabilitation goals to achieve. Transition to rehabilitation is then safe and acceptable to the patient and the receiving rehabilitation team. A geriatrician will also be able to enhance discharge planning when rehabilitation is not required, but medico social problems need addressing. Residential care, community services, discussions about advanced care planning or terminal care would fall into this category. Again, more detailed future studies investigating patient outcome in this setting would be desirable.

In addition to the practical advantages of patient management outlined above, there are significant benefits to the involved medical, nursing and allied health personnel. Junior medical staffs as well as the nursing staff have the opportunity of enhanced learning or maintaining their skill of medicine as it pertains to the elderly and having a reliable, single port of call for patient- related non- surgical problems. At the same time it enables surgical trainees and senior surgeons to focus on their core skills, whilst still able to have a targeted discussion about medical problems of their patients with a single senior physician.

Another significant conclusion that may be drawn from this study is the potential for cost reduction. Traditionally multiplying the length of stay by an average per-diem cost from external sources derives this. Using figures from our institution (daily average hospital cost 1666 AUD at the time of writing) the institution of a geriatric vascular service yields a benefit of roughly 1830 AUD per admitted patient. The authors are aware that there is significant controversy in regards to appropriate and accurate patient cost estimation in relation to length of stay [5,6]. In the times of activity based funding, which is now applied to most health care systems, the cost related to length of stay may decreasing in proportion. In fact quite complex models for cost calculation are advocated in recent literature taking in account multiple institutional, patient and economic factors [7,8]. It can be therefore safely said, that LOS does have an impact on overall hospitalization cost per patient and remains an important marker of hospital efficiency. It further needs to be considered, that decreased LOS results in faster patient turnover and higher total admissions per year. Commercial business consultancies still consider reducing LOS as an efficient way to increase hospital revenue [9]. A more detailed cost analysis would be desirable and should be subject of further research.

The authors are aware that there are limitations to their study. The nature of a retrospective cohort study limited access to single patient data. Hence, a detailed demographic comparison is lacking. However, since a homogenous group of patients in an established facility was investigated, it is fair to assume that the demographics did not change with the employment of additional doctors. Also, whilst a quite impressive effect on LOS and cost could be demonstrated it certainly would have been of interest to look at rates of 30 day and long term mortality and possibly number of specialty referrals. However, this is study is meant as a pilot to establish the feasibility of a vasculogeriatic service. The former aspects certainly need to be investigated in further prospective research.

To the authors' knowledge, this is the first time an integrated geriatric service has been investigated in the vascular surgical setting. Similar models have been studied and established in other surgical specialties particularly orthopedic surgery. Both specialties, vascular and orthopedic surgery, share a similar patient pool of the elderly and frail with multiple comorbid conditions. They also regularly suffer from impaired mobility. Orthogeriatric care was pioneered in the 1950s in the UK by Devas and colleagues who reported earlier restoration of patient independence and reduced length of hospital stay [10]. A recent meta-analysis investigating the effect of orthogeriatric care for patients with hip fractures found significant reduction in mortality (long-term and in-hospital) as well as LOS especially in the "shared care" model [11], Orthogeriatric care is now considered best practice in most countries and in many it is incorporated in the guidelines of the relevant societies or governing bodies [12-14].

Furthermore, the benefits of Geriatric Evaluation and Management (GEM) in improving patient outcomes, reducing functional decline, mortality, readmissions, length of stay and cost, are well known and have a strong evidence base [15-20]. Between 2004 and 2051 the proportion of the Western Australian population aged over 65 years is predicted to increase from approximately 12% to 26%. Those over 85 years of age will increase from 1% to 6% [21]. Efficient use of hospital beds will require excellent care of older people with a focus on maintaining function during an episode of acute care and moving into sub acute care quickly.

Conclusion

A joint vascular surgical and geriatric service reduces inpatient length of stay and cost. This is congruent with established joint geriatric services in other surgical specialties that deal with similar patient cohorts. Whether the improvement in perioperative care, secondary prevention and management of geriatric syndromes translates into improved morbidity and mortality remains a subject of further study. We recommend this model as a beneficial improvement in vascular surgical care.

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