A multidisciplinary quality improvement program for older patients admitted to a vascular surgery ward

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We dedicate this work to the memory of our colleague and mentor Professor Philip Walker.

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ABSTRACT

Background: Older vascular surgical patients are at high risk of hospital-associated complications and prolonged stays.

Aims: to implement a multidisciplinary co-management model for older vascular patients and evaluate impact on length of stay, delirium incidence, functional decline, medical complications and discharge destination.

Methods: prospective pre-post evaluation of a quality improvement intervention, enrolling pre-intervention (August 2012-January 2013) and post-intervention cohort (September 2013-March 2014). Participants were consenting patients aged 65 years and over admitted to the vascular surgical ward of a metropolitan teaching hospital for at least 3 days.

Intervention was physician-led co-management plus a multidisciplinary improvement program targeting delirium and functional decline. Primary outcomes were length of stay (LOS), delirium and functional decline. Secondary outcomes were medical complications and discharge destination. Process measures included documented consultation patterns.

Administrative data were also compared for all patients aged 65 and older for 12 months pre- and post-intervention.

Results: We enrolled 112 participants pre-intervention and 123 participants post-intervention. Length of stay was reduced post-intervention [geometric mean 7.6 days vs 9.3 days; ratio of geometric means 0.82 (95% CI 0.68-1.00), $p=0.04$]. There was a trend to less delirium [18 (14.6%) vs 24 (21.4%), $p=0.17$] and functional decline [18 (14.6%) vs 27 (24.3%), $p=0.06$],

with greatest reductions in the urgently admitted subgroup. Administrative data showed reduced median length of stay (5.2 days vs 6 days, $p=0.03$) and greater discharge home (72% vs 50%, $p<0.01$).

Conclusions: Physician-led co-management plus a multidisciplinary improvement program may reduce length of stay and improve functional outcomes in older vascular surgical patients.

INTRODUCTION:

A large proportion of inpatients cared for by vascular surgery services care are aged 65 years and older, and many of these have multimorbidity and are frail. These patients are at risk of more complications, longer hospitalisations, higher mortality and greater dependence following surgery compared to younger and less frail patients ¹⁻⁶. Delirium and functional decline are common complications in older vascular surgical patients ⁷⁻⁹. Incident delirium affects up to 39% of vascular surgical patients ⁷⁻¹⁰, and 20- 26% of older surgical patients need increased assistance with activities of daily living following hospitalisation ^{11,12}.

Co-management by non-surgical specialists (physicians, geriatricians or hospitalists) might improve outcomes of high risk surgical patients such as those with hip fracture ^{13,14}. Potential benefits of consistent and proactive physician input are prevention and earlier identification of medical complications and geriatric syndromes, better coordination of multi-specialty input, improved collaboration with nursing and allied health professionals, and opportunities for collaborative quality improvement ^{15,16}. There are emerging reports of co-management in

vascular surgical patients. Pre-post evaluations of a hospitalist co-management model in the USA showed reduced mortality and adverse events but higher costs¹⁷⁻¹⁹, but was based on administrative data only. A recent randomized controlled trial of geriatrician-led comprehensive assessment and co-management of older vascular surgical patients in England showed a reduction in length of stay, delirium, cardiac complications and institutional discharge²⁰. However this study only included elective admissions, and poor outcomes are more common in non-elective admissions^{1,21,22}.

We previously developed and implemented a multidisciplinary quality improvement program called “Eat Walk Engage” on a general medical ward²³. This program aims to reduce delirium and functional decline by facilitating evidence-based practices including early and regular mobility, adequate nutrition, and meaningful cognitive activities. Pilot evaluation showed improved care processes and reduced length of hospital stay in older general medical patients²³. In a retrospective descriptive study⁹ of older vascular surgical patients we found a high incidence of delirium and functional decline similar to medical inpatients, so vascular ward staff were interested in implementing the program. Vascular surgeons were dissatisfied with inconsistent medical advice and fragmented discharge planning, so we proposed combining physician-led co-management with “Eat Walk Engage”, and obtained a research grant in partnership with a senior vascular surgical leader.

The study aim was to implement this combined complex intervention on the vascular surgical ward and evaluate its impact on patient and health service outcomes. We hypothesized that

the intervention would reduce delirium, functional decline and major medical complications, thereby reducing length of stay and improving discharge home to usual level of care (Appendix figure S1). We pre-planned subgroup analysis in urgently admitted patients. Reporting follows SQUIRE guidelines²⁴ for quality improvement reports.

MATERIALS AND METHODS:

The study was conducted in a 23 bed vascular surgical ward in a publicly-funded metropolitan teaching hospital. Staffing included 5 vascular surgeons, 1-2 senior fellows, 3-4 registrars and 4 junior doctors. The inpatient ward had a 1:4 nurse-patient ratio. Referrals could be made to specialist nurse discharge planning and allied health professionals (AHP: physical therapy, occupational therapy, speech pathology, dietetics, orthotics and social work). Prior to the intervention, AHP and senior nursing staff met weekly to plan complex discharges, but medical staff did not attend. Medical consultations for all surgical services were initiated through the general or specialty medicine registrar on call for the day.

The intervention consisted of two linked parts and was supported by experienced facilitators (AM and PM) from a clinical background but not involved in service delivery in the vascular ward. Firstly, we aimed to move from consultation to co-management. A half-time dedicated senior general medical registrar was available five days per week on the ward, and aimed to review all patients aged over 65 and younger patients with complex co-morbidities, prioritising cases based on daily discussion with the surgical and nursing team. The registrar conducted daily rounds, provided advice and support to junior doctors, helped coordinate other consultations, supported daily huddles and weekly discharge planning meetings with the multidisciplinary team, and assisted after-hours handover. The registrar rotated 6 monthly, supervised by a consistent general physician in twice weekly rounds. As the model evolved, the medical team conducted twice weekly joint rounds with surgeons.

Secondly, we introduced the “Eat Walk Engage” program²³. The facilitators engaged a local multidisciplinary work group (MDWG); identified care practices for older patients through patient and staff interviews and process audits; supported reflection on practice to prioritise improvements; and supported small improvement cycles with a focus on early mobility, nutrition and hydration, and meaningful cognitive activities. Monthly MDWG meetings encouraged team communication and shared goals. A half-time multi-professional allied health assistant (AHA) assisted with system-level (e.g. updating orientation boards) and individual-level delegated activities (e.g. mobility assistance).

The intervention was supported by a senior academic-clinical collaboration and a competitive grant from the Australian Centre for Health Service Innovation. Resources included reallocation of 0.5 full-time equivalent (FTE) medical registrar, 0.2 FTE general physician, and 0.4 FTE facilitator from existing resources within the Internal Medicine Department and Safety and Quality Unit; and 0.5 FTE AHA funded by the grant.

We used a prospective pre-post evaluation because changes were introduced iteratively at whole-of-ward level. Patient outcomes and care processes were measured in patient cohorts recruited before and after implementation, allowing nine months for the intervention to mature. Eligible participants were consecutive patients aged 65 and older admitted to the vascular surgery ward pre- (August 2012-January 2013) or post-intervention (September 2013-March 2014), with anticipated length of stay 3 days or more, and excluded if they were palliative, previously enrolled, discharged/transferred within three days, or unable to be assessed within seven days of admission (e.g. prolonged intensive care stay). Participants

were recruited by trained research assistants. Written informed consent was obtained from all participants, or statutory decision maker if they lacked capacity to consent.

In addition, to assess system-level impact and include participants who may have been under-represented in the cohort study due to consent requirements (especially frail patients and those with cognitive impairment), we obtained acute length of stay, discharge to usual residence from acute episode, and mortality data from the hospital information manager for all acute episodes of patients aged 65 and older discharged from the vascular surgical ward for 12 months before (February 2012-January 2013) and following commencement of the intervention (February 2013-January 2014). The study was approved by the hospital Human Research Ethics Committee and registered (ANZCTR 12612001201864).

Within the consenting participant cohort, primary outcomes of length of stay (LOS) under the vascular surgery unit, delirium and functional decline were specified to capture patient and organisational impact of the intervention. LOS was number of days from admission until discharge or transfer from the vascular team. Delirium was identified by the research assistant using a combination of the Confusion Assessment Method 3 times per week until discharge plus complete medical record review²⁵. Functional status was measured as the number of basic activities of daily living (ADL: bathing, dressing, transfer, mobility, toileting and feeding) documented by nursing staff as needing human assistance in structured nursing documentation which is completed daily, with score from 0 (fully independent) to 6 (fully

dependent). Functional decline was defined as an increase in ADL by 1 point or more between admission and discharge from the vascular unit ²⁶.

Secondary outcomes included serious medical complications, discharge destination and total hospital LOS. Medical complications were identified from medical record review using the Accordion classification, including all serious complications (grade 2 or higher) in the analysis ^{8,27}. Delirium, pressure injuries and falls were reported separately. Discharge destination was classified as discharge home to usual care (community living or usual nursing home) or institutional discharge (transfer to another inpatient unit, rehabilitation, other subacute care or new nursing home placement). Total hospital LOS included days in any acute or subacute transfer destination, until definitive discharge to community or nursing home. Process measures used to assess team coordination included the documented frequency and timing of specialty and AHP consultations. Quality improvement measures including patient interviews, activity mapping, and mealtime audits²⁸ were reported back to the ward at baseline, mid- and late intervention.

Participant characteristics were obtained by structured medical record abstraction, including demographics, diagnosis, elective or urgent (admissions via emergency department, same-day outpatient admissions or inter-hospital transfer), co-morbidities, number of medications, procedure, and items for the V-POSSUM physiological and operative severity scales ²⁹. An admission interview included cognition (Abbreviated Mental Test ³⁰) and nutrition risk (Malnutrition Screening Tool ³¹).

Participant characteristics were summarized using mean or median for continuous variables and proportions for categorical variables. V-POSSUM severity scores were calculated using the calculator available online³². In view of the skewed distribution of length of stay and unequal variances, data were log-transformed and compared using t-test, with ratio of geometric means and 95% confidence intervals calculated by back-transforming. The proportion of participants developing delirium, functional decline, medical complications, or discharged to institutional care was compared using chi-square test. We undertook pre-planned stratified analyses by admission urgency. To adjust for baseline imbalance between groups, we undertook multivariable analyses using generalised linear model with gamma log-link function for length of stay and logistic regression for delirium and functional decline, adjusting for age, sex, Charlson comorbidity index, admission ADL function, admission cognitive function and elective status, and tested for interaction between intervention and elective status. We summarised consultation patterns as the proportion of participants receiving a consultation, average number of consultations per participant, and median (IQR) days from admission to first consultation. We estimated 140 participants per group would have 80% power to show a two day reduction in length of stay and reduction from 33% to 20% in functional decline and delirium.

In the administrative data we compared median acute length of stay using Mann Whitney u test, and discharge home to usual care and mortality using chi-square test, between the pre-

intervention and post-intervention cohorts. All analyses were undertaken in SPSS version 25, and a p value of <0.05 was considered significant in all analyses.

RESULTS:

Funding was obtained in July 2012. Intervention planning, pre-intervention data collection, and MDWG meetings commenced in August 2012, co-management commenced in February 2013 (after completing pre-intervention data collection), and the AHA commenced in July 2013. Patient interviews, practice audits, facilitator observations and MDWG discussions identified areas for improvement including multidisciplinary communication, early and regular mobilizing, sitting out for meals, mealtime interruptions, and opportunities for cognitive engagement. Specific solutions developed by the MDWG (table 1) were iteratively implemented February-September 2013. The post-intervention cohort was collected from September 2013-March 2014.

We enrolled 112 participants pre-intervention and 123 post-intervention (appendix figure S2). Participant characteristics are summarized in table 2. Pre-and post-intervention cohorts were similar except the pre-intervention cohort had more cognitive impairment and comorbidities. More than half were urgent admissions, and 71 (30%) did not have an operation. The urgently admitted subgroup were older (76.2 vs 73.4 years, $p=0.002$), had higher physiological severity (23.0 vs 20.3, $p=0.001$) and were less likely to have operative intervention [79/127 (62.2%) vs 85/108 (78.7%), $p=0.001$].

LOS under the vascular surgical unit was significantly reduced in the post-intervention patient cohort [geometric mean 7.6 days vs 9.3 days, ratio of means 0.82 (95% CI 0.68-1.00), $p=0.04$]. Urgently admitted participants had much longer stays than elective participants, and

accounted for most of the LOS reduction (table 2). Patterns were similar for total hospital LOS (table 2). In multivariable modelling adjusting for potential confounders, mean LOS under vascular surgical unit was reduced by 2 days [estimated marginal mean 9.7 days (95% CI 8.6-10.9) vs 11.7 days (95% CI 10.3-13.2), $p=0.07$] but did not reach significance.

There was a trend to less delirium [18 (14.6%) vs 24 (21.4%), $p=0.17$] and functional decline [18 (14.6%) vs 27 (24.3%), $p=0.06$] post-intervention (table 3). The majority of these complications occurred in urgently admitted participants, and both complications were significantly reduced within this subgroup: delirium from 21/56 (35.6%) to 11/68 (16.2%), OR 0.35 (95% CI 0.15-0.81, $p=0.01$) and functional decline from 23/36 (39.7%) to 14/68 (20.6%), OR 0.41 (95% CI 0.18-0.89, $p=0.02$). In multivariable analysis adjusting for potential confounders, functional decline was significantly reduced [OR 0.47 (95% CI 0.22-1.00), $p=0.05$] post-intervention. Delirium was not significantly lower post-intervention overall [OR 0.81 (95% CI 0.36-1.78) $p=0.59$] but there was a significant interaction between intervention status and elective status.

There was no significant difference in discharge home (to community or usual nursing home) between pre-intervention and post-intervention cohorts; discharge home was much less common in the urgently admitted subgroup (table 2). Major medical complications were not reduced, occurring in 29 (25.9%) of pre-intervention participants and 30 (24.4%) of post-intervention participants (appendix table S1). Complications were common in the urgently

admitted subgroup. One participant died pre-intervention (in the non-elective cohort); there were no deaths in the post-intervention cohort.

In the pre-intervention group, general medicine registrars reviewed 19 (17.0%) and physicians 10 (8.9%) participants; post-intervention this increased to 57 (46.3%) and 44 (35.8%). Median time from admission to first review fell from 5 days (IQR 3-11) to 3 days (IQR 2-5) for the registrar and 8 days (IQR 6-24) to 3 days (IQR 2-5) for the physician. Consultations from other specialty medical services occurred in 42% of participants in both time periods, but mean consultations per patient fell from 4.6 (SD 8.9) pre-intervention to 2.8 (SD 3.9) post-intervention ($p=0.04$) (Appendix 1 figure S3). Mean AHP reviews fell from 10.0 (SD 16.1) pre-intervention to 7.1 (SD 8.2) post-intervention ($p=0.09$).

Administrative data were available for 388 patients aged 65 and older February 2012-January 2013 (mean age 76 years, SD 7.3) , and for 437 patients February 2013-January 2014 (mean age 74 years, SD 7.0). Median acute LOS fell from 6.0 days (IQR 3.1 to 10.9) pre-intervention to 5.2 days (IQR 2.2 to 9.8) post-intervention ($p=0.03$). Findings were similar if analysis used t-test of log transformed data (geometric mean 5.8 days vs 5.0 days, $p=0.02$). Inpatient death occurred in 5 patients (1.3%) pre-intervention and 3 (0.7%) post-intervention ($p=0.49$). The proportion of patients discharged home or to usual care at the end of the designated acute stay increased from 190/383 (50%) to 311/434 (72%) post-intervention ($p<0.01$).

DISCUSSION:

We implemented a multidisciplinary collaborative intervention including physician-led co-management and “Eat Walk Engage” for older vascular surgical patients, and evaluated it by measuring patient-level outcomes in a prospective pre-post comparative cohort study supported by analysis of system-level data. Almost half of the participants were non-elective admissions and this group accounted for the majority of medical and geriatric complications, with much longer stays and greater risk of institutional discharge than the elective subgroup. There were promising improvements in delirium, functional decline and length of stay in this subgroup, and although the small sample limits confidence in these findings, the significant improvements in acute length of stay and discharge home seen in the administrative data analysis suggest that these improvements were clinically important.

Recent studies including meta-analysis of geriatrician-led co-management of older surgical patients¹³, and a trial of geriatric assessment and management in older elective vascular patients²⁰ have shown that length of stay may be reduced in selected older surgical patients by geriatrician-led co-management. Our study adds to the evidence regarding physician co-management by including urgently admitted and non-operative patients, and investigating a general physician-led model. A hospitalist co-management model in vascular surgical patients from the USA¹⁷⁻¹⁹ did not demonstrate decreased LOS, but our intervention was more complex, implementing improvements in geriatric care practices through “Eat Walk Engage”. Our findings align with evidence for multidisciplinary delirium prevention interventions in vascular surgery, abdominal surgery and hip fracture populations^{20, 33-35}. We

did not see a reduction in other medical complications. Previous findings regarding co-management and complications are inconsistent, and limited by variation in definitions and reporting.

Patients in both cohorts had substantial medical input into their care, illustrated by the frequency and variety of consulting medical specialties. The co-management team reviewed half of older participants, but 42% also received consultations from other specialties. The reduction in specialty consultation frequency in the post-intervention cohort suggests an important coordinating role by the medical team ¹⁵. Reduced AHP review frequency may reflect better team coordination and effective delegation to the AHA. Multidisciplinary engagement, daily rounding, regular team meetings, and use of evidence-based interventions to prevent delirium and functional decline were all important features consistent with recent consensus indicators for co-management of older patients ¹⁶.

Strengths of our study include the inclusion of urgently admitted patients, pre-specified analysis plan, prospective enrolment, detailed patient-level process and outcome data supplemented by administrative data analysis, and a structured approach to implementation and reporting. We also recognise several weaknesses in this pragmatic, single centre improvement study. Our study was small due to the inherent challenges recruiting frail and acutely ill inpatients into a time-limited study, limiting power in the main analysis and subgroups. However the changes seen in administrative data before and after the intervention support the clinical significance of our findings. The pre-post design may have led to bias due

to measured and unmeasured confounders, although multivariable analysis supported the direction of the findings. For practical reasons, delirium was only measured three times per week (rather than the gold standard of daily assessment) which may have underestimated incidence, but sensitivity was enhanced by using structured chart review²⁵. Functional status was obtained using structured daily documentation, which may slightly overestimate dependency compared to patient report, but this approach been validated in previous studies measuring functional decline^{26,36}. There was no adjustment for multiple outcomes, so results should be interpreted with caution, particularly subgroup analyses.

Nevertheless, our study adds important new information to existing literature about the role of physician co-management of vascular surgical patients, adding to published models¹⁷⁻²⁰. Medical co-management led by a general physician, combined with a multidisciplinary approach to implementing geriatric care principles, may reduce length of stay and increase discharge home, and may particularly benefit non-elective patients. Larger, multi-site studies enrolling urgently admitted patients are needed to reliably evaluate the benefits of this promising approach.

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Table 1: Key challenges and solutions identified by the multidisciplinary work group

Challenges identified	Solutions
Poor interdisciplinary communication	Daily team huddle including nursing, physiotherapy, junior medical staff and other allied health professionals Weekly joint medical/surgical ward round
Limited walking assistance Unclear staff and patient mobility expectations No walking destination on ward	Additional AHA 10am-2pm daily Team education to support consistent advice Improved team communication Small table and chairs set up near window with fishbowl, magazines
Frequent breakfast interruptions by complex dressings Frequent breakfast interruptions by surgical rounds Poor appetite leading to small portions consumed	Reduction in frequency of dressings in line with best evidence Surgical staff educated to encourage meal consumption High protein high energy meals standard for patients aged 65 and older
Limited cognitive resources for patients Television fees expensive	Daily newspaper, DVD player and puzzles/jigsaws purchased from fundraising and donations, supported by AHA Television subsidies negotiation with hospital foundation

Limited opportunities for social contact with other patients	Weekly afternoon tea supported by AHA and hospital volunteers
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Table 2: Participant characteristics at admission in pre-intervention and post-intervention cohorts. SD standard deviation; ADL activities of daily living

	Pre-intervention N=112	Post-intervention N=123	p
Age, mean (SD)	75.3 (6.6)	74.7 (6.5)	.53
Male sex, n (%)	84 (75.0)	88 (71.5)	.55
Residential aged care, n (%)	5 (4.5)	3 (2.4)	.39
Charlson score, mean (SD)	2.6 (1.7)	2.0 (1.7)	.002
Medications, mean (SD)	8.7 (4.2)	7.5 (4.1)	.04
Dependent in ADL at admission, n (%)	26 (23.2)	19 (15.4)	.131
Abbreviated mental test <7, n (%)	14 (12.5)	3 (2.4)	.003
Malnutrition screening test ≥ 2 , n (%)	19 [†] (17.8)	18 (14.6)	.54
Admission type, n (%)			.69
Elective	53 (47.3)	55 (44.7)	
Non-elective	59 (52.7)	68 (55.3)	
Operative severity, n (%)			.75
No operation	37 (33.0)	34 (27.6)	
Minor/moderate	20 (17.9)	18 (14.6)	

Major	47 (42.0)	60 (48.8)	
Complex major	8 (7.1)	11 (8.9)	
V-POSSUM Physiological severity score, mean (SD)	22.6 (5.7)	20.9 (5.6)	.97

† data missing for 5 participants

Table 3: Primary and secondary outcomes in pre-and post-intervention cohorts in all participants, and stratified by urgent or elective admission status. Length of stay is geometric mean and 95% confidence intervals, back-transformed from logarithmic data.

<i>All participants</i>	<i>Pre (n=112)</i>	<i>Post (n=123)</i>	<i>p</i>
Functional decline, n (%)	27 (24.3)	18 (14.6)	.06
Delirium, n (%)	24 (21.4)	18 (14.6)	.17
Length of stay under vascular unit, mean (95% CI), days	9.3 (8.0-10.7)	7.6 (6.7-8.7)	.04
Discharge home, n (%)	81 (72.3)	99 (80.5)	.14
Total hospital length of stay, mean (95% CI), days	10.6 (8.9-12.6)	8.5 (7.3-9.9)	.06
Serious medical complications, n (%)	29 (25.9)	30 (24.4)	.79
Falls, n (%)	4 (3.6)	5 (4.1)	.84
Pressure injuries, n (%)	13 (11.6)	6 (4.9)	.06

<i>Non-elective participants</i>	<i>Pre (n=59)</i>	<i>Post (n=68)</i>	<i>p</i>
Functional decline, n (%)	23 (39.7)	14 (20.6)	.02
Delirium, n (%)	21 (35.6)	11 (16.2)	.01
Length of stay under vascular unit, mean (95% CI), days	12.6 (10.6-15.0)	9.3 (7.8-11.0)	.02
Discharge home, n (%)	32 (54.2)	46 (67.6)	.12
Total hospital length of stay, mean (95% CI), days	15.7 (12.6-19.6)	11.2 (9.1-13.7)	.03
Serious medical complications, n (%)	20 (33.9)	22 (32.4)	.85
Falls, n (%)	3 (5.1)	4 (5.9)	1.0
Pressure injuries, n (%)	10 (16.9)	5 (7.4)	.10
<i>Elective participants</i>	<i>Pre (n=53)</i>	<i>Post (n=55)</i>	<i>p</i>
Functional decline, n (%)	4 (7.5)	4 (7.3)	.96
Delirium, n (%)	3 (5.7)	7 (12.7)	.21
Length of stay under vascular unit, mean (95% CI), days	6.6 (5.4-8.0)	6.0 (5.1-7.1)	.28
Discharge home, n (%)	49 (92.4)	53 (96.4)	.38
Total hospital length of stay, mean (95% CI), days	6.8 (5.5-8.6)	6.0 (5.1-7.1)	.48
Serious medical complications, n (%)	9 (17.0)	8 (14.5)	.73
Falls, n (%)	1 (1.9)	1 (1.8)	1.0

Pressure injuries, n (%)	3 (5.7)	1 (1.8)	.36
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SUPPLEMENTARY MATERIAL (Appendix)

Figure S1: Model principles and hypotheses.

Figure S2: Participant recruitment

Table S1: Medical complications (assigned accordion grading of 2 or more) occurring during vascular ward stay, by intervention status

Figure S3: Consultation patterns before and after implementing the intervention.

A multidisciplinary quality improvement program for older patients admitted to a vascular surgery ward

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ABSTRACT

Background: Older vascular surgical patients are at high risk of hospital-associated complications and prolonged stays.

Aims: to implement a multidisciplinary co-management model for older vascular patients and evaluate impact on length of stay, delirium incidence, functional decline, medical complications and discharge destination.

Methods: prospective pre-post evaluation of a quality improvement intervention, enrolling pre-intervention (August 2012-January 2013) and post-intervention cohort (September 2013-March 2014). Participants were consenting patients aged 65 years and over admitted to the vascular surgical ward of a metropolitan teaching hospital for at least 3 days.

Intervention was physician-led co-management plus a multidisciplinary improvement program targeting delirium and functional decline. Primary outcomes were length of stay (LOS), delirium and functional decline. Secondary outcomes were medical complications and discharge destination. Process measures included documented consultation patterns.

Administrative data were also compared for all patients aged 65 and older for 12 months pre- and post-intervention.

Results: We enrolled 112 participants pre-intervention and 123 participants post-intervention. Length of stay was reduced post-intervention [geometric mean 7.6 days vs 9.3 days; ratio of geometric means 0.82 (95% CI 0.68-1.00), $p=0.04$]. There was a trend to less delirium [18 (14.6%) vs 24 (21.4%), $p=0.17$] and functional decline [18 (14.6%) vs 27 (24.3%), $p=0.06$], with greatest reductions in the urgently admitted subgroup. Administrative data showed reduced median length of stay (5.2 days vs 6 days, $p=0.03$) and greater discharge home (72% vs 50%, $p<0.01$).

Conclusions: Physician-led co-management plus a multidisciplinary improvement program may reduce length of stay and improve functional outcomes in older vascular surgical patients.

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