Original Article

Optimising Cardiology Ambulatory Care Pathways: A Comprehensive Approach to Admission Avoidance and Timely Intervention in a Post-Pandemic Healthcare Landscape

K Teh, C MacLeod, RT Campbell, D Murdoch, K Mangion & F Ahmad

Abstract

Introduction: Cardiovascular diseases are a substantial burden on healthcare systems, contributing significantly to avoidable hospital admissions. We propose a Cardiology Ambulatory Care Pathway.

Methods: Conducted a 1 month study redirecting admission streams from primary and emergency care, into a Cardiology Ambulatory Care Hub providing triage in Hot Clinic, and access to a Multi-Modal Testing Platform.

Results: 98 patients were referred to the Ambulatory Care Hub, 91 of which avoided admission. 52 patients received care in the cardiology hub, 38 of which required further testing.

Conclusion: We successfully streamlined various service streams, reducing admissions, and improving patient outcomes. Outpatient CTCA, ambulatory ECG, and echocardiography proved instrumental. We project a cost saving of £53,379 per month in bed days (£640,556 annual saving).

Keywords

ambulatory care, cardiovascular disease, cost of hospitalisation, reduce admissions, hot clinic

Key points

- Hospitalisations related to cardiac pathology have increased, emphasising the need to avoid unnecessary hospital stays.
- The Ambulatory Care Pathway redirects acute inpatient streams into access to an Ambulatory Care Hub, providing patient triage, and access to acute multi-modal testing, in order to avoid admissions.
- This pilot program successfully avoided admission in 91 patients (93%) in 1 month.
- This translates to a cost saving of £53,379 per month in bed days (£640,556 annual saving).
- Access to CT coronary angiography, ambulatory ECG monitoring, and echocardiography are essential.

Ken Teh[*1]

Claire MacLeod[*2]

Ross T. Campbell[3]

David Murdoch[4]

Kenneth Mangion[4]

Faheem Ahmad[4]

[1] Clinical fellow in Cardiology, University of Glasgow
[2] Medical student, University of Glasgow
[3] Senior clinical lecturer, University of Glasgow
[4] Consultant Cardiologist, QEUH Glasgow

* Joint 1st author

Background

Cardiovascular diseases constitute a significant portion of ambulatory care sensitive conditions, accounting for approximately one-third of all cases.[1] Reducing preventable admissions is a pressing challenge, particularly as a growing elderly population intersects against diminishing acute bed capacity in secondary care.[2,3] One-sixth of hospital admissions could potentially be managed outside the traditional acute care environment, thereby offloading pressured on saturated inpatient resources.[4, 5,6]

Emergency admissions related to cardiac pathology, have surged by nearly a third in recent years.[7,8] Hospitalisation itself poses a range of risks for elderly and vulnerable patients, including nosocomial infections, iatrogenic harm, and the perils of deconditioning resulting from prolonged bed rest.[9] This 'post-hospital' syndrome is increasingly recognised in the medical literature, further underscoring the need to avoid unnecessary hospital stays.[10,11]

Prolonged waiting lists following the COVID-19 pandemic have forced patients unable to access specialist care to resort to the emergency department as their medical conditions deteriorate.[12] Cardiovascular mortality remains the largest non-covid cause of excess mortality in England.[12]

We hypothesised that an ambulatory care hub would provide a more focused and integrated care framework to address these challenges. A hub model would effectively shift the locus of investigation and treatment away from

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the acute care setting and into an adjacent clinic-based intermediary space, where diagnoses and therapeutics could be efficiently delivered within a compressed episode of care. This shift towards an ambulatory hub model represents a significant strategy to alleviate the burden on stressed healthcare systems.

Methods

Between September and October 2022, we prospectively enrolled patients through our Cardiology Interface Care Pilot at the Queen Elizabeth University Hospital, Glasgow (a University Teaching hospital with primarily secondary care cardiology services), recruiting individuals from both primary care and the emergency department and channelling them into a dedicated cardiology Ambulatory Care Hub (Figure 1).

This holistic pathway consisted of several key components: an Emergency Department (ED) In-reach Service, Consultant Connect (r) (for primary care physicians), and a multi-modal testing platform (with access to same day testing).

The consultant-led in-reach service operated daily in the ED, aimed at facilitating prompt discharge and expedited testing for patients presenting with low-risk pathologies such as chest pain (acute, non-cardiac; chronic cardiac), palpitations, and syncope. Concurrently, Consultant Connect (r) offered general practitioners (GP's) direct telephone access to cardiology specialists for obtaining same-day advice. Daily "hot clinics" were established to redirect patients from these two streams requiring specialist testing and/or consultation for review within 24 hours. We allocated dedicated resourcing for same-day or next-day multi-modal testing, including exercise treadmill testing (ETT), ambulatory ECG, echocardiography and CT coronary angiography (CTCA).

We conducted a further sub-group analysis of clinical case records for patients scheduled for rapid access outpatient CTCA. This analysis aimed to examine their background demographic profiles, the impact on hospitalisation rates, and subsequent alterations to their clinical care, including any adjustments or discontinuation of medications as necessitated by their diagnostic findings. Although a formal health economic analysis was outside the scope of this pilot, an estimate of bed days saved was made on the assumption patients treated through the hub were being admitted to hospital.

Results

Over a 4 week period our ambulatory hub strategy managed to redirect 91 patients out of 98 (93 %) referred patients away from medical ward admission (either from the emergency department or primary care) (Figure 2).

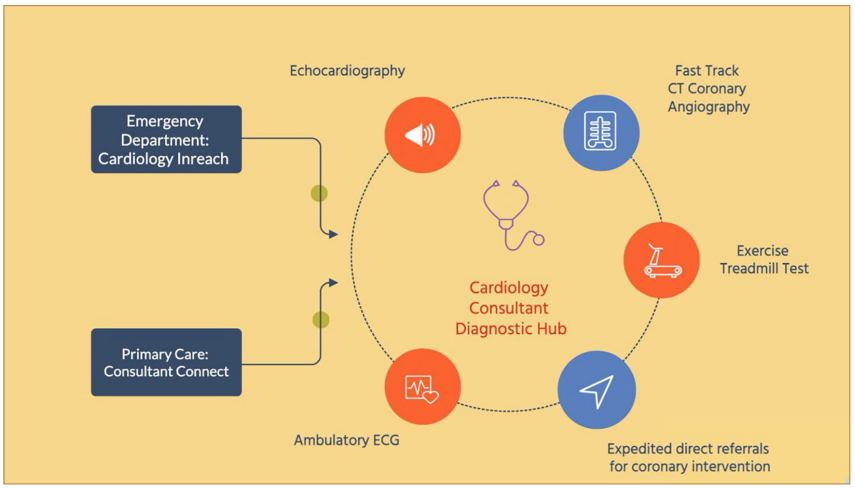


Figure 1. Structure of the cardiology ambulatory care hub system

Emergency department in-reach

43 patients (16, 37% female, 27, 63%, mean age 62.5 years), were reviewed directly in in ED. 36 patients were directly discharged from ED (thereby avoiding a further 24 hours of unnecessary hospitalisation pending cardiology review). None of these patients required re-admission to the emergency department with the index excluded cardiac pathology.

The majority of patients requiring review were those requiring exclusion of an acute coronary syndrome (31 patients [71%]) and arrhythmia (10 patients [23%]). A significant number required further hot clinic review (21 patients [49%]) and expedited testing (24 patients: CTCA,8; ambulatory ECG, 4; echocardiogram, 3).

Primary Care

55 calls were directed from primary care to a consultant cardiologist. 30 patients (55%) were triaged to the cardiology hot clinic. 12 (22 %) required further testing.

Cardiology Hub

51 patients were reviewed in the cardiology hub – all would have otherwise been admitted. 31 were directed from primary care (table 2). Of 51 patients reviewed in the Hot Clinic, 38 (75%) required ongoing testing.

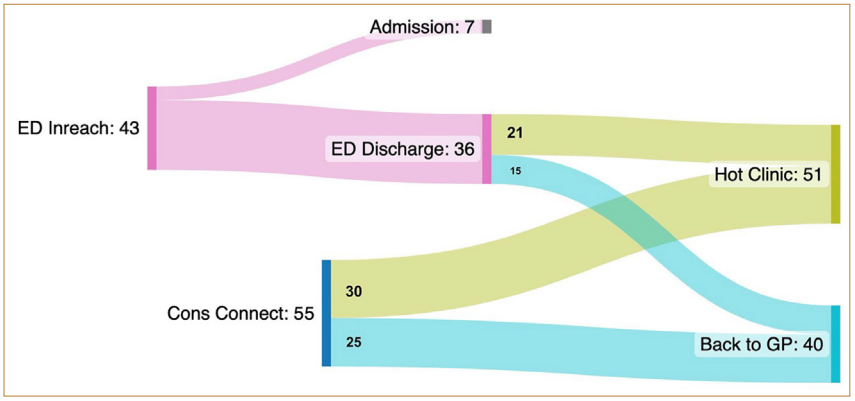


Figure 2. Re-direction of patient flow away from hospitalisation

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Table 1. Patient Characteristics (ED Inreach and Ambulatory Clinic)

	ED Inreach		Ambulatory Clinic	
Demographics				
Age, median (IQR)	62	(21-82)	64	(31 - 82)
Female	16	(37 %)	28	55
Risk factors				
HTN	22	(51 %)	27	53%
HChol	23	(53 %)	33	65%
DM	10	(23 %)	12	24%
CKD	6	(14 %)	8	16%
Prev MI	18	(42 %)	13	25%
FH of CVD	13	(30 %)	21	41%
Smoking	21	(49 %)	25	49%

HTN: Hypertension, HChol: Hypercholesterolaemia, DM: Diabetes Mellitus. CKD: Chronic Kidney Disease, MI: Myocardial Infarction, FH of CVD: Family History of Cardiovascular Disease

Table 2. Ambulatory Hub: Presenting features

Source		
Emergency Department	21	(41 %)
Primary Care direct	30	(59 %)
Symptoms		
Chest pain	32	(52 %)
Palpitations	10	(20 %)
Dyspnoea / ankle swelling	8	(15 %)
Syncope	1	(2%)
Further Testing *		
Any test	38	(75 %)
CTCA	17	(33 %)
Echo	10	(20 %)
Ambulatory ECG	7	(14 %)
ETT	5	(10 %)
Expedited coronary angiography	2	(4 %)

* note some patients received multiple tests

CTCA: CT Coronary Angiogram, ECG: Electrocardiogram, ETT: Exercise Tolerance Test

23 patients were selected for fast track out-patient CTCA (13 [56%] males, 10 [43%] females, mean age 57 yrs). All patients had at least one underlying cardiovascular risk factor (hypercholesterolaemia 48%, hypertension 39%, diabetes mellitus 26%, ex-smoker 43%). Findings of no-, mild- and flow-limiting coronary heart disease were found in 10 (45%), 7 (32%) and 5 (23%) of cases respectively. CTCA informed a subsequent change in clinical decision making in all cases: Hospitalisation avoided in 22 cases (95%); cessation of medication, 8 (33%); continued change to medical therapy, 14 (77%); onward urgent coronary angiography, 4 (17%).

Cost-effectiveness

Patients referred into the ambulatory hub would otherwise have entered the admissions stream, requiring at least 24 hours of in-patient stay before cardiology reviews could be obtained. Admission avoidance of 91 patients translates - using the NHS National Tariff for in-patient acute bed days - into a minimum estimated cost saving of £53,379 per month (£640,556 annual saving).[13]

Discussion

Our cardiology ambulatory care program has demonstrated the potentially transformative impact of realigning existing pathways under a streamlined consultant-led service tailored to prioritise admission avoidance.

The existing referral, diagnostics and treatment pathway has multiple bottlenecks, requiring a systems level approach to maximise patient flow and delivering timely care throughout the patient journey. Flow remains complex involving multiple feedback loops that suggests that simply increasing one component of the pathway is insufficient to guarantee timely care. By focusing holistically on a hub model of care, and uniting various service streams, including in-reach services, a direct consultant led contact point for primary care, and acute testing within a specialised hub, we avoided displacing activity (and consequent waiting times) from one part of the pathway onto another.

Interface care arises from the challenge of calculating clinical risk amongst undifferentiated patients in primary care (where limited access to diagnostic testing and specialised expertise often tilts the balance towards hospitalisation). [14] By bringing the secondary care interface closer, intensified expert evaluation and testing can help mitigate this risk, improve confidence in the diagnoses, and help initiate therapeutic interventions to reduce risk to a level manageable in the community. This approach allows for the delivery of care in an intermediate location, adjacent to but not within the acute care stream thus preventing hospitalisation.

Prolonged waiting lists in the wake of the coronavirus pandemic have raised three major concerns: unnecessary hospitalisation, progression to worsened morbidity, and increased mortality. Cardiovascular death remains the leading cause non-Covid-19 excess mortality in England.[12] Preliminary evidence suggests that an elevated number of patients have succumbed whilst on waiting lists for clinic review. In our health board, waiting lists for cardiology clinic appointments have extended to a minimum of 6 months (with significant outliers). Cardiovascular disease is progressive and requires timely intervention before serious morbidity ensues. The event of hospitalisation itself is an adverse event impacting prognosis.[15,16] Primary care physicians,

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cognisant of compounding risks arising from extended waiting lists, may consider delays in specialist assessment significant enough to tip the balance toward admission, and the associated costs to the NHS. The ambulatory hub, with its capacity for both timely review and early testing, proves critical in mitigating this.

Our model demonstrated a high level of safety for patients identified as requiring further input. Over a one year period, early diagnosis and therapy helped to ensure that no patients were re-hospitalised with their index cardiac pathology. Decongestion of the ED is critical – an additional 36 patients per month (432 per year) may not appear like a notable amount but even minor increments in congestion of the ED are independent risk factors for morbidity (just 8 hours of increased aggregate waiting time raises the standardised mortality rate of a department by 10%).[17] A patient spending just one additional hour in a cubicle can reduce the throughput of the department by one third.[18] Exit-block caused by patient admitted unnecessarily merely to await downstream cardiology review compounds this saturation hazard.

To effectively reduce hospital admissions, an integrated approach is critical. Each component—namely, in-reach services, testing capabilities, and specialist hot clinics—are indispensable for risk to be rapidly assessed and mitigated. This will become more common with an increase in comorbidity associated with an ageing population. For patients discharged directly from the ED, 58% required further assessment at hub, 66% required ongoing testing. From the primary care group, results were similar; 55% required further review and 22% additional testing. Without both strategies of review and testing, care will merely be displaced from one waiting list to another, with admission ensuing in the interim waiting period. The hub also enables clinicians to titrate and assess the efficacy of early treatment strategies and adjust the trajectory of the patient away from admission.

Unsurprisingly, CT coronary angiography, ambulatory ECG monitoring and echocardiography are the critical core tests for early review of patients with suspected ischaemia, heart failure and arrhythmia – the most common cardiac ambulatory-care sensitive conditions.[19] The consequent benefits of CTCA on rationalising unnecessary medical therapy were also observed in our study.[20]

The success of our pilot, rooted in pro-active in-reach and early diagnostic assessments, draws from proven strategies employed in other healthcare services.[19] Extrapolating its effectiveness can be reasonably assured, as our pilot was conducted during a period of lower overall hospital admissions. Our cost-estimates likely underplay the full extent of the savings.

Whilst additional resourcing of consultant time would be required, in our centre, optimising workflow by rebalancing downstream work (from more general ward care) towards upstream activity (work in the diagnostic hub) would facilitate the initial introduction of the service. Key to the success of the pilot – and any implantation – is close collaboration and partnership across specialty disciplines (cardiology, acute medicine, radiology) and professions (physicians, cardiac physiologists, nurse practitioners). Adopting a more iterative and agile response to project management (as opposed to a conventional top-down approach) has been critical to make sure all stakeholders remain consistently engaged and that the learning process can be continuous and adaptive. In this way we were able to ensure that the processes and solutions deployed were always able to match the specified requirements of those working at the clinical frontline.

Conclusion

Our study demonstrates the effectiveness of a holistic cardiology ambulatory care model in mitigating unnecessary hospital admissions and facilitating timely interventions. By harmonising existing pathways and leveraging consultant-delivered care, we have provided strategies to address challenges posed by extended waiting lists in the post-pandemic healthcare environment. This integrated approach holds promise for improving patient outcomes, reducing healthcare burdens, and enhancing the overall quality of cardiovascular care.

Acknowledgements

We would like to thank

Wendy Cruickshanks (Clinical Service Manager) for her active support in helping administer the project, and Drs Colette Jackson, Andrew Davie and Jacqueline Adams (Consultant Cardiologists) and Tommy Gardiner, Claire Steele, Claire Darroch, Donna Campbell and Melissa Harrison (Cardiology Advanced Nurse Practitioners) for helping deliver frontline care to patients of the pilot. We also thank Dr David Stobo and Prof Giles Roditi (Consultant Cardiac Radiologists), Tracey Hopkins (Reseach Imaging Superintendent), Evonne MacLellan (Senior Research Radiographer) and Catherine Vaughan (Clinical Lead for Cardiac Physiology) for their help with the cardiac imaging and testing components of the ambulatory hub.

Funding

The authors received no financial support for the research, authorship, and/or publication of this article

Conflict of interest

Ross Campbell [RTC] reports consultancy honorarium from Boehringer Ingelheim and speaker honorarium from AstraZeneca.

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