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Integrated care teams in primary care improve clinical outcomes and care processes in patients with non-communicable diseases

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ABSTRACT

Introduction: Primary care physicians face the increasing burden of managing multimorbidities in an ageing population. Implementing an integrated care team (ICT) with defined roles and accountability to share consultation tasks is an emerging care model to address this issue. This study compared outcomes with ICT versus usual care for patients with multimorbidities in primary care.

Methods: Data was retrospectively extracted from the electronic medical records (EMRs) of consecutive adult Asian patients empanelled to ICT and those in UC at a typical primary care clinic (polyclinic) in eastern Singapore in 2018. The study population had hypertension, and/or hyperlipidaemia and/or type 2 diabetes mellitus (T2DM). Clinical outcomes included the proportion of patients (ICT vs. UC) who attained their treatment goals after 12 months. Process outcomes included the proportion of patients who completed annual diabetic eye and foot screenings, where applicable.

Results: Data from 3,302 EMRs (ICT = 1,723, UC = 1,579) from January 2016 to September 2017 was analysed. The ICT cohort was more likely to achieve treatment goals for systolic blood pressure (SBP) (adjusted odds ratio [AOR] = 1.52, 95% confidence interval [CI] = 1.38–1.68), low-density lipoprotein cholesterol (AOR = 1.72, 95% CI = 1.49–1.99), and glycated haemoglobin (AOR = 1.28, 95% CI = 1.09–1.51). The ICT group had higher uptake of diabetic retinal screening (89.1% vs. 83.0%, $p < 0.001$) and foot screening (85.2% vs. 77.9%, $p < 0.001$).

Conclusion: The ICT model yielded better clinical and process outcomes than UC, with more patients attaining treatment goals.

Keywords: non-communicable diseases, outcome and process assessment (health care), patient care team

INTRODUCTION

Non-communicable diseases are increasingly prevalent in developed countries.[1,2] There has been a sharp increase in the number of patients with more than one noncommunicable disease or multimorbidity, especially in countries with rapidly ageing populations such as Singapore.[3,4] These patients are commonly managed in primary care and need multifaceted, coordinated and personalised care plan for optimal management. However, a single primary healthcare provider may face challenges in meeting and delivering their complex care needs within a short consultation. Work-related stress inevitably increases, resulting in burnout of these primary care physicians.[5] Consequently, more of them retire early or convert to part-time clinical practice or switch profession. The shrinking workforce further compounds the imbalance of increasing care needs of patients with multimorbidity and fewer physicians to serve them.

In Singapore, three clusters of public primary care clinics (polyclinics) serve the local multi-ethnic Asian population. Although these polyclinics provide subsidised, fee-for-service primary healthcare, patients can have more than one primary healthcare providers. One such cluster is SingHealth Polyclinics, which operate eight polyclinics in the southern and eastern regions of Singapore. The polyclinics rely heavily on the physicians to deliver all relevant care processes for each patient with multimorbidity and coordinate the care processes to screen for related complications. Each polyclinic physician manages about 45–60 patients on a work day. The current care model appears unsustainable to support the healthcare needs of a population with evolving demographic characteristics and escalating disease burden.

In contrast to a single provider for each patient, team-based care is emerging as an alternative care model to support patients with multimorbidity. It is defined as the provision of health services to individuals, families and/or their communities by at least two healthcare providers who work collaboratively with patients and their caregivers.[6] The scope of care

provision and mutual goal setting are major components of team-based care.[7] Team-based care has been shown to increase patient satisfaction,[8,9] health outcomes[10] and cost-effectiveness.[11] The creation of integrated care teams (ICTs) is the first step towards institutional service delivery change to team-based care.

An ICT often comprises multidisciplinary healthcare professionals, leveraging on their respective expertise to deliver the multifaceted care to the patients and support their myriad and varying care needs. Concurrently, clinic infrastructures, such as electronic medical record (EMR) system and care processes (communication platform and services), are being developed to support information sharing, and enhance coordination and flexibility in its implementation.[12] The strategies for creating successful ICT include building collaboration within team members, defining individual roles and standardising work procedures.

A care model involving ICT was piloted in a typical polyclinic in eastern Singapore. The hypothesis was that this care model would improve the health outcomes and uptake of screening of complications among patients with multimorbidity.

The study aimed to compare health and process outcomes of Asian patients with multimorbidity between those in the ICT group and others in the usual care (UC) group after 12 months. The proportions of patients who attained evidence-based treatment goals for type 2 diabetes mellitus (T2DM), hypertension and dyslipidaemia in each group were the key care process outcomes. The proportions of patients with T2DM who completed their retinal and feet screening in the two groups were the key care process outcomes.

METHODS

Clinical data was extracted from the EMRs of a retrospective cohort of patients on the basis of their diagnoses of hypertension, dyslipidaemia and T2DM from January 2016 to September 2017. This data was reviewed, audited and analysed in late 2018.

The study site was a primary care clinic (polyclinic) in Bedok town in eastern Singapore. Twenty physicians in this polyclinic serve 281,300 multi-ethnic Asians residing in Bedok. The polyclinic manages an average of 1,000 patients daily, with each physician attending to 50–60 patients on a single work day. A registry of patients at this study site was created using population management tools. The clinic layout was configured to accommodate the ICT, which occupied a specified module at the polyclinic, with its dedicated set of consultation rooms.

The ICT comprised five doctors, one nurse clinician, one nurse care manager and one care coordinator. Each ICT team member had defined roles, tasks and responsibilities. The pharmacists and social worker could be co-opted into the ICT on a need basis. An algorithm-based care plan underpinned the coordination and management of patients with multimorbidity. For example, the physicians would review the pharmacotherapy, the care manager ensured timely screening for T2DM-related complications, the nurse clinician guided the patient in lifestyle modification and preventive health, and the care coordinator arranged the next appointment date and would arrange hospital referrals if required. The ICT collectively accounted for the health and process outcomes of each patient, which were shared in fortnightly huddles.

In the UC group, each patient would be managed by a single polyclinic physician and would be referred to other healthcare professionals at the latter's discretion. The attending physician could vary between visits. The polyclinic is collectively accountable for the health and process outcomes of the patients in the UC group.

Inaugurated in January 2016, the polyclinic IT system automatically empanelled patients in the ICT group with prescheduled appointments to three specified consultation rooms. A total of 1,723 consecutive patients were empanelled to the ICT group from January

to March 2016 (n = 1,723). The polyclinic patient registry defines the total number of patients with their respective medical conditions.

Meanwhile, 1,579 consecutive patients seen by other polyclinic physicians during the same period were assigned to the UC group. Data was collated from both groups over the next 18 months till 30 September 2017.

The eligibility criteria for inclusion in the study were as follows: patients aged 21 years or older and who had at least one non-communicable disease (NCD) i.e. hypertension, dyslipidaemia, T2DM, ischaemic heart disease, stroke, peripheral vascular disease, chronic kidney disease, with or without chronic respiratory conditions (asthma, chronic obstructive pulmonary disease), whose EMR showed at least one further visit to the polyclinic in the next one year. Patients who were primarily followed up for NCD by other care providers such as specialists or other primary care physicians and only attended this polyclinic for acute episodic illnesses were excluded.

The polyclinic EMR automatically stratified the cardiovascular risks of the patients on the basis of the modified Framingham risk score for Singapore.[13] The risk stratification determined the treatment goals of the patients, which were indicated on the dashboard of the EMR for easy references by the attending physicians. In this way, patients were grouped into Green, Amber and Red (low, medium and high cardiovascular risks, respectively) subgroups on the basis of their diagnoses of hypertension, hyperlipidaemia, and T2DM and associated risk factors (Appendix).

The health outcomes were as follows: (a) change in mean measurements of systolic blood pressure (SBP), HbA1c and low-density lipoprotein (LDL)-cholesterol during the observation period for patients in both groups; (b) the change in the proportion of patients who achieved treatment goals for blood pressure, HbA1c and LDL-cholesterol compared with similar changes of the other patients with the respective medical conditions in the polyclinic

patient registry; and (c) the change in the proportion of patients with low (Green), medium (Amber) and high (Red) cardiovascular risk groups over the 18 months. The high-risk group (Red) comprised patients with poorly controlled T2DM, hypertension and dyslipidaemia. The low risk (Green) group comprised patients who had attained treatment goals of all three medical conditions. The medium risk (Amber) group comprised patients with these medical conditions that were sub-optimally controlled (Appendix).

The main process outcomes were the proportion of patients with T2DM in each group who completed their diabetic retinal screening for retinopathy and foot screening within the past year of their visit. Such data was retrieved from their EMRs.

Data was extracted from two polyclinic EMR databases (Polyclinic Patient Information System and Sunrise Clinical Manager). Visit data was extracted from the Outpatient Administrative System. Data was first exported to Microsoft Excel (Excel 2013; Microsoft Corp, Redmond, WA, USA), and preliminary statistical analyses were carried out using the R software version 3.4.1 (R Core Team, Vienna, Austria). The base, 'tidyverse' and 'data table' R packages were used for data cleansing before forwarding to the biostatistician for further analysis.

Data was summarised using descriptive statistics. Continuous variables were summarised as mean ± standard deviation and categorical variables were summarised as frequency (percentage). The paired *t*-test was used to assess differences between the baseline blood pressure measurements, and HbA1c and LDL measurements in both groups. All analyses were performed in accordance with the intention-to-treat principle. All statistical tests were two-tailed, and a p-value < 0.05 was considered statistically significant.

Generalised estimating equations (GEEs)[14,15] were used for univariate and multivariable analyses for the outcomes of mean SBP, LDL-cholesterol and HbA1c, with adjustment for age, gender and number of visits capped at eight visits. The same was done for

the proportion of subjects with mean SBP, LDL-cholesterol and HbA1c to target. Missing data was less than 5% and assumed to be missing completely at random. The GEE approach takes into account all values from all times points, including the first, intermediate to the last visits and involves estimating the population-averaged effect and is robust to misspecification of the variance. It simultaneously investigates all time points while controlling for within-subject correlation of repeated measures.

The SingHealth Centralised Institutional Review Board approved the study protocol (Reference number: CIRB 2017/2089). The study received the Health Services Research and Analytical Technologies for SingHealth grant (Grant ID HEARTS/2017/008) for nonmonetary project mentorship and data analysis support.

RESULTS

Data from 1,783 patients in the ICT group registry was reviewed; of these patients, 1,723 were eligible to be included in the ICT group. Data of 1,749 patients was reviewed, and 1,579 of them were selected for inclusion in the UC group (Fig. 1).

Table I shows the demographic characteristics of the study population. The ICT group had marginally lower mean baseline blood pressure, LDL-cholesterol and HbA1c values at baseline, which are not statistically significant.

Table II shows the GEE models for HbA1c, SBP and LDL. Multivariable analysis showed that SBP was significantly reduced by 1.74 mmHg in the ICT group compared with the UC group over eight visits, after adjusting for age, gender and number of visits. Multivariable analysis showed that LDL-cholesterol was significantly reduced by 0.085 mmol/L in the ICT group compared with the UC group and HbA1c was significantly reduced by 0.19%.

Table III shows the GEE models for HbA1c, SBP and LDL to target. Patients in the ICT group were shown to be 50% more likely to achieve treatment goal in SBP (adjusted odds ratio

[AOR] = 1.52) after multivariable analysis. They were also more likely to achieve treatment goals in LDL-cholesterol and HbA1c (AOR = 1.72 and AOR = 1.28, respectively).

Table IV shows the process data. The uptake rates of annual diabetic photography and diabetic foot screen for patients with diabetes mellitus were significantly better in the ICT cohort at baseline, and this pattern continued over time.

Within the ICT group, a higher proportion of patients in the high-risk (Red) group had shifted to the low-risk group (Green) by the end of the observation period compared with those in the UC group (29.8% vs. 18.9%, p = 0.025). There were no significant differences in the proportions of patients shifting from high to medium (Red to Amber) or medium- to low- (Amber to Green) risk groups.

Table I. Baseline characteristics of the study population in the ICT and UC groups.

Characteristic	%		p-value
	ICT (n = 1,723)	UC (n = 1,579)	
Mean age* (yr)	66.3 ± 9.8	65.8 ± 10.7	0.16
Female	56.1	54.8	0.45
Ethnicity			
Chinese	72.4	74.7	0.13
Indian	5.2	3.7	0.04
Malay	18.3	17.2	0.41
Others	4.1	4.5	0.57
Hypertension	85.6	83.5	0.10
Hyperlipidaemia	86.1	83.7	0.05
Diabetes mellitus	44.6	46.3	0.33
Ischaemic heart disease	15.4	15.1	0.81
PVD	0.5	0.9	0.17
Stroke	5.8	7.6	0.04
Renal disease	9.3	8.8	0.62
> 4 diagnoses	3.7	4.0	0.65
Cardiovascular risk[†]			
Low	35.3	28.5	< 0.001
Medium	10.1	9. 6	0.60
High	33.1	35.3	0.18
Very high	18.1	18.5	0.29
NA (missing info)	3.4	8.1	< 0.001
Baseline clinical data			
Systolic BP* (mmHg)	129.9 ± 14.19	132.1 ± 16.40	< 0.001

LDL cholesterol* (mmol/L)	2.52 ± 0.73	2.62 ± 0.80	< 0.001
HbA1c*	7.0 ± 1.28	7.1 ± 1.40	0.0013
BP to target	79.7	67.6	< 0.001
LDL cholesterol to target	80.3	68. 8	< 0.001
HbA1c to target for subjects with DM	54.5 [n = 769]	47.4 [n = 732]	0.006

**Data expressed as mean ± standard deviation. †Modified Framingham risk score for Singapore. BP: blood pressure; DM: diabetes mellitus; HbA1c: haemoglobin A1c; ICT: integrated care team; LDL: low-density lipoprotein; NA: not available; PVD: peripheral vascular disease; SD: standard deviation; UC: usual care*

Table II. Univariate and multivariable GEE models for HbA1c, SBP and LDL.

Outcome	Univariate model		Multivariable model	
	Estimate (95% CI)	p-value	Estimate (95% CI)	p-value
HbA1c				
ICT (ref: UC)	−0.20 (−0.31 to −0.09)	< 0.001	−0.19 (−0.29 to −0.08)	< 0.001
Age	−0.01 (−0.02 to −0.01)	< 0.001	–	–
Gender (ref: female)	−0.08 (−0.196 to 0.03)	0.15	–	–
Visit	0.01 (0.003–0.02)	0.012	–	–
SBP				
ICT (ref: UC)	−1.71 (−2.47 to 0.94)	< 0.001	−1.74 (−2.50 to −0.98)	< 0.001
Age	0.10 (0.63–0.14)	< 0.001	–	–
Gender (ref: female)	−0.19 (−0.95 to 0.58)	0.63	–	–
Visit	−0.25 (−0.34 to −0.16)	< 0.001	–	–
LDL				
ICT (ref: UC)	−0.091 (−0.140 to 0.040)	< 0.001	−0.085 (−0.13 to −0.034)	< 0.001
Age	−0.019 (−0.022 to −0.017)	< 0.001	–	–
Gender (ref: female)	−0.122 (−0.170 to −0.070)	< 0.001	–	–
Visit	−0.027 (−0.031 to −0.024)	< 0.001	–	–

CI: confidence interval; GEE: generalised estimating equation; HbA1c: haemoglobin A1c; ICT: integrated care team; ref: reference group; SBP: systolic blood pressure; UC: usual care

Table III. Univariate and multivariable GEE models for HbA1c, SBP and LDL to target.

Outcome	Univariate model		Multivariable model	
	Estimate (95% CI)	p-value	Estimate (95% CI)	p-value
HbA1c on target				
ICT (ref: UC)	1.31 (1.11–1.54)	0.0011	1.28 (1.09–1.51)*	0.0029
Age	1.04 (1.03–1.05)	< 0.001	–	–
Gender (ref: female)	1.07 (0.91–1.26)	0.4	–	–
Visit	0.97 (0.95–0.99)	0.0013	–	–
SBP on target				
ICT (ref: UC)	1.52 (1.38–1.68)	< 0.001	1.52 (1.38–1.68)*	< 0.001
Age	1.01 (1.01–1.02)	< 0.001	–	–
Gender (ref: female)	0.91 (0.82–1.0)	0.054	–	–
Visit	0.97 (0.95–0.99)	< 0.001	–	–
LDL on target				
ICT (ref: UC)	1.68 (1.46–1.94)	< 0.001	1.72 (1.49–1.99)*	< 0.001
Age	1.03 (1.02–1.04)	< 0.001	–	–
Gender (ref: female)	0.68 (0.59–0.78)	< 0.001	–	–
Visit	1.07 (1.05–1.09)	< 0.001	–	–

**Adjusted for age, gender and number of visits. CI: confidence interval; F: female; GEE: generalised estimating equations; HbA1c: haemoglobin A1c; ICT: integrated care team; LDL: low-density lipoprotein cholesterol; ref: reference group; SBP: systolic blood pressure; UC: usual care*

Table IV. Process data.

Process	ICT	UC	p-value
Diabetic retinal photography done in past year			
Baseline	87.8% (568/647)	79.0% (482/610)	–
End of study	89.1% (614/689)	83.0% (551/664)	0.001
Diabetic foot screen done in past year			
Baseline	86.5% (589/681)	76.1% (485/637)	–
End of study	85.2% (620/728)	77.9% (540/693)	< 0.001

ICT: integrated care team; UC: usual care

DISCUSSION

Overall, the results revealed significant improvements in health and process outcomes in patients managed by ICT compared with those in UC. The proportions of patients achieving treatment goals and also improvements in the mean measurements of SBP, LDL and HbA1c

were higher in the ICT group. Although the absolute change in the mean measurements was small, these may still translate into future reduction in complication risks. Reduction of LDL-cholesterol by 1 mmol/L reduces major cardiovascular events by 28%;[16] a population-wide reduction of 1 mmHg in SBP reduces heart failure events by 13 events per 100,000 person-years;[17] and reduction in HbA1c by 1% reduces peripheral vascular disease by 43% and microvascular disease by 37%.[18] Therefore, a smaller reduction such as the HbA1c of 0.2% over 18 months observed in our study could translate into clinically significant reductions in complications over time.

More patients underwent diabetic retinal and foot screenings in the ICT group. More patients in the high-risk group transited to the low-risk group in the ICT group than in the UC group. Because of such favourable outcomes resulting from empanelling patients to ICT, three more ICTs have been established at this polyclinic as the fee-for-service healthcare system allows more patients to be empanelled. This care model has also been scaled up for implementation in the rest of the seven SingHealth Polyclinics after this study.

The empanelment of patients to the same ICT facilitates continuity of their care, coordinates the care processes and allocates resources pending on their care needs.[19,20] Patients with high cardiovascular risks or complex care needs are directed to the more experienced senior polyclinic physician for management. They are allocated more consultation time to deep-dive into their complex care needs.

A common consolidated record eases the management of the patients by the ICT. The ICT members can access and evaluate the clinical status of their patients from a dashboard developed using population management tools.

Lunch-time team huddles were held every fortnight, during which team-specific quality indicators were shared to review their clinical performances. These meetings provided a platform for team members to discuss their difficulties and brainstorm for solutions.

Physical colocation of the ICT members in the same hub within the polyclinic facilitates their interaction and communication. Such a framework enhances the team collegiality, accountability and ownership of the care of their empanelled patients.

The ICT members have defined roles. For example, the care manager in the ICT is a nurse who serves as a health coach to activate patients, set goals and coordinate their care. Boyd et al have shown in their randomised controlled trial that older patients with multimorbidity reported higher quality care when a nurse was included in the team.[21]

The success of the ICT in this study is likely due to the multiple components within the care model. It will continue to evolve by incorporating evidence-based measures that have been shown to be effective in other clinical establishments involving ICT concept.[19]

This study's strengths included meticulous data clean-up after its extraction from a sizable number of patient records. There has been no prior Asian study on ICT, especially in the challenging setting of a fee-for-service healthcare system, where patients are not mandated by national healthcare policy to adhere to a dedicated primary care provider.

Nonetheless, there is concern on the difference in the baseline disease control between the groups due to the retrospective nature of the study. However, the data reflects the consequences of real-life practice of providers in both groups, where each manages daily load of 50–60 patients. The vast loads hinder the implementation of a randomised controlled trial within a very busy polyclinic.

Another limitation is that patients may have crossed between groups when they came for unscheduled visits. Management practices may have been shared informally between members in both groups. The study period of 18 months was an adequate duration to see improvements in process outcomes but may have been inadequate for demonstrating clinical outcomes or benefits resulting from longer-term care.

Patients in the ICT group were not explicitly educated about their empanelment, although this was implied by the colocation of the team members in a colour-coded hub. The scope of this study also did not address other important aspects of ICT, such as patient and staff satisfaction,[20] cost-effectiveness and potential reductions in hospital visits.

Further studies could also be carried out, as this care model has been expanded to other polyclinics to assess other factors that may impact outcomes, such as the sociodemographic environment surrounding each clinic and differences in clinic leadership and clinic culture.[22] Additional non-cardiovascular or metabolic outcomes can be examined, as studies have shown improvement in the uptake of depression screening[23] and preventive health tasks such as immunisations.[24]

In conclusion, health and process outcomes improved incrementally via the support of integrated care team in primary care. The proportion of patients with high cardiovascular risks reduced in the ICT group after a year, which may collectively translate into future reduction in cardiovascular complications. Future research should focus on staff and patient satisfaction and cost-effectiveness of this ICT model.

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FIGURE

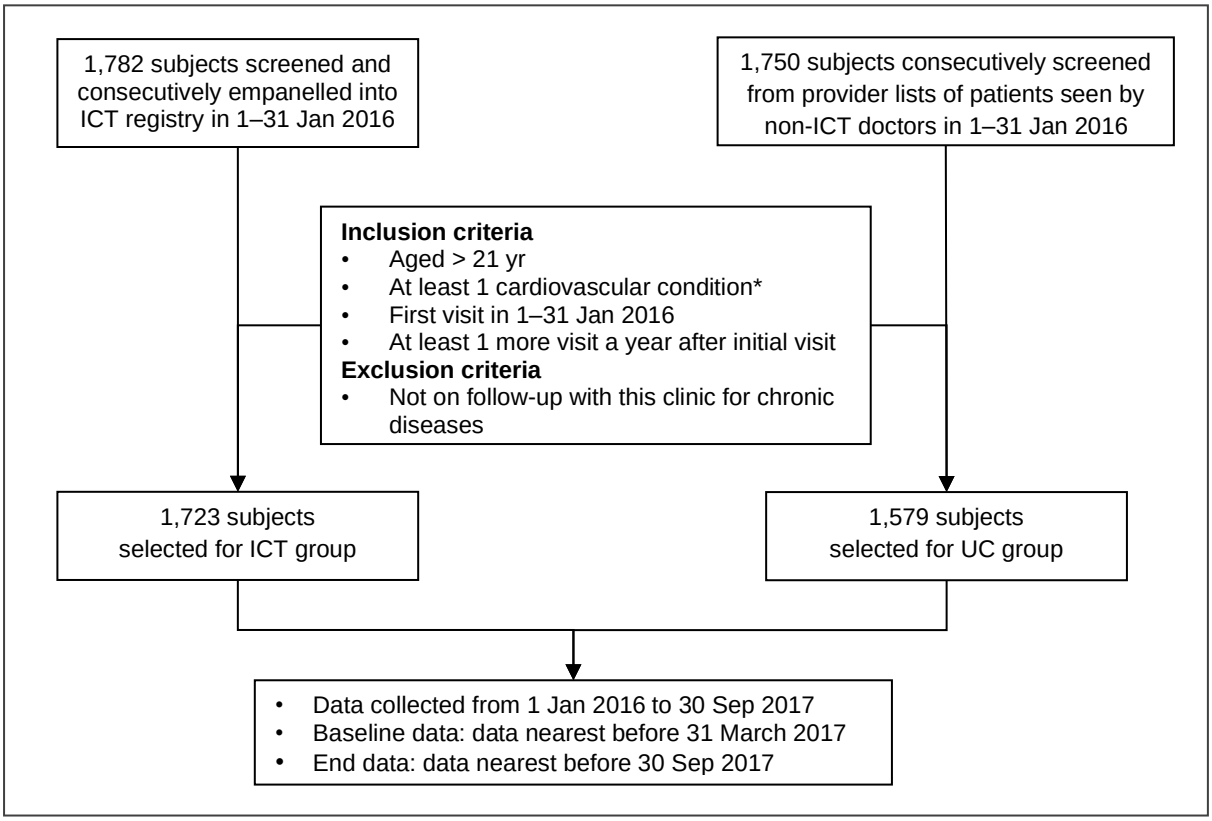

Fig. 1 Flowchart shows study enrolment. *Hypertension, hyperlipidaemia, type 2 diabetes mellitus, ischaemic heart disease, stroke, peripheral vascular disease, chronic kidney disease

ICT: integrated care team; UC: usual care

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APPENDIX

Supplementary Table I. Stratification into green, amber and red subgroups.

Clinical criteria	SBP	LDL	Hba1c	Number of diagnoses†	Condition
Green	• < 140 mmHg if below 80 years old • < 150 mmHg if 80 years or older	• < 2.1 mmol/L if very high cardiovascular (CV) risk* • < 2.6 mmol/L if high cardiovascular risk (e.g. DM only) or if very high CV risk but with factors that result in eventual target LDL < 2.6. • < 3.4 mmol/L if medium CV risk • < 4.1 mmol/L if low CV risk	• < 7.1% if less than 75 years • < 8.1% if more than 75 years	Any number of diagnoses	All conditions for SBP and LDL must be met
Amber	• 140–160 mmHg if below 80 years • 150–160 mmHg if 80 years or older	• ≥ 2.1 mmol/L but < 3.4 mmol/L if very high CV risk • ≥ 2.6 mmol/L but < 4.1 mmol/L if high cardiovascular risk (e.g. DM only) or if very high CV risk but with factors that result in eventual target LDL < 2.6. • ≥ 3.4mmol/L but < 4.9 mmol/L if medium CV risk. • ≥ 4.1 mmol/L but < 4.9 mmol/L if low CV risk	• > 7.1% but less than 9.5% if less than 75 years • ≥ 8.1% but less than 9.5% if more than 75 years.	≤ 4 diagnoses.	Any condition met for systolic BP or LDL met and not more than 4 diagnoses
Red1	• 140–160 mmHg if below 80 years • 150–160 mmHg if	• ≥ 2.1 mmol/L but < 3.4 mmol/L if very high cardiovascular risk.	• ≥7.1% but less than 9.5% if less than	> 4 diagnoses	Any condition met for systolic bp or LDL and

	80 years or older	• ≥ 2.6 mmol/L but < 4.1 mmol/L if high cardiovascular risk (e.g. DM only) or very high CV risk but with factors that result in eventual target LDL of < 2.6 • ≥ 3.4mmol/L but < 4.9 mmol/L if medium CV risk • ≥4.1 mmol/L but <4.9 mmol/L if low CV risk	75 years. • ≥ 8.1% but less than 9.5% if more than 75 years		more than 4 diagnoses
Red2	>160 mmHg	• ≥ 3.4 mmol/L if very high cardiovascular risk (original target LDL 2.1) • ≥ 4.1 mmol/L if high cardiovascular risk (e.g. DM only) or if very high CV risk but with factors that result in eventual target LDL of < 2.6. • ≥ 4.9 mmol/L for medium and low CV risk	HbA1c ≥ 9.5%	≤ 4 diagnoses	Any condition for systolic BP or LDL met and not more than 4 diagnoses
Red3	> 160 mmHg	• ≥ 3.4 mmol/L if very high cardiovascular risk (original target LDL 2.1) • ≥ 4.1 mmol/L if high cardiovascular risk (e.g. DM only) or if very high CV risk but with factors that result in eventual target LDL < 2.6	HbA1c ≥ 9.5%	> 4 diagnoses	Any condition met for systolic BP or LDL and more than 4 diagnoses

		• ≥ 4.9 mmol/L for medium and low CV risk			

**Cardiovascular risk based on Framingham risk score modified for Singapore. †Diagnoses refer to hypertension, dyslipidaemia, T2DM, ischemic heart disease, stroke, peripheral vascular disease, chronic kidney disease, asthma and chronic obstructive pulmonary disease*