

Project Title

Lower Extremity Amputation Prevention Programme (LEAPP): Cost Effective Rapid Access Multidisciplinary Limb Salvage and Medical Optimisation in Diabetic Foot Ulcer (DFU) Management

Project Lead and Members

Project Lead: Dr Hong Qiantai

Project Members: Dr Liew Huiling, Tiffany Chew Wen Ying, Goh Cheng Cheng, Adj Asst Prof Muhammad Farhan B Mohd Fadil

Organisation(s) Involved

Tan Tock Seng Hospital

Healthcare Family Group(s) Involved in this Project

Medical

Applicable Specialty or Discipline

General Surgery, Endocrinology

Project Period

Start date: 01 December 2017

Completed date: 28 July 2021

Aim(s)

- To reduce irreversible Lower Extremity Amputation (LEA)
- To embark on a transformation project comprising podiatrists, vascular surgeons and endocrinologists to provide multidisciplinary team care in managing patients with diabetic foot ulcer (DFT)

Background

See poster appended/ below

Methods

See poster appended/ below

Results

See poster appended/ below

Lessons Learnt

Resource Rationalisation and Clarity on Expectation of Team Commitment

Running coordinated care requires complex schedule arrangements. Resource constraints and high workload were two main constraints that refrained some stakeholders from participating in the MDT. Hence, for resource optimisation, the team rationalised the must-haves and good-to-haves, such that not all the clinical members need to be in the one-stop clinic on the same day. With better clarity on expectations on commitment level, the less-convinced stakeholders eventually onboarded.

Logistics and Room Set-Up

We co-located podiatric equipment and certain offloading modalities required for patients' foot wound care. The changes to clinic room set-up were minimal. Besides reallocating clinic rooms to ensure a seamless workflow and patient journey, the only cost incurred was for a 2-in-1 clinical and rehabilitation examination couch to save space within the consultation and treatment room.

We co-ordinated the care of diabetes nurse clinicians for diabetes care counselling including initiation of insulin, education of hypoglycaemia avoidance and self-monitoring of blood glucose. We also streamlined workflows to co-ordinate bloods and medications prescribed by the various specialists respectively within one clinic.

Referral Sources are Pivotal in the Success of the Programme

The addition of an additional podiatrist specialising in diabetes foot wound care as well as a diabetic foot co-ordinator to streamline the patients' referral between primary and tertiary care commenced in 2020 under a population health grant.

Upstream appropriate referral is crucial as it is the first patient touch point for early access to LEAPP. Besides defining explicit inclusion and exclusion clinical criteria, patients' understanding on clinical and economical impact and perceived value of the programme are believed to be key determinants of their turnout at the LEAPP clinic. With an average defaulter rate of 25%, the team aims to improve in obtaining patients' buy-in.

Conclusion

Coordinated multidisciplinary care benefits patients, clinicians, hospital and society. There has been cost savings and quality of life improvements with better clinical outcomes for the patients. This can be achieved through adjustments in mindset and schedules, without significant change in infrastructures. A common goal and buy-in is the key to change initiation and maintenance of results.

Additional Information

It has been 4 years and 6 months since TTSH started the LEAPP programme.

Leveraging on synergism with NHG DM Foot Workgroup, LEAPP and DEFINITE Care, the NHG Team for the National DM Foot Collaborative - in conjunction with the MOH National Improvement Unit (NIU) National Performance Steering Committee (NPSC) will collaboratively work together to provide optimal care for patients with diabetes foot disease.

To enhance care for patients with DFUs and prevent DFU-related amputations, NHG started the Diabetic Foot in Primary and Tertiary (DEFINITE) Care programme in June 2020. DEFINITE Care is a first-of-its-kind initiative that integrates and coordinates multidisciplinary care for such patients across primary and tertiary settings in NHG, including the National Healthcare Group Polyclinics (NHGP), Tan Tock Seng Hospital (TTSH), Khoo Teck Puat Hospital (KTPH), and the upcoming Woodlands Health (WH).

The multidisciplinary care team comprises doctors, nurses and Allied Health Professionals from Vascular Surgery, Endocrinology, Orthopaedics Surgery, Primary Care, Podiatry, and Nursing. This holistic and integrated approach enables patients early detection, diagnosis, and treatment.

As of June 2021, more than 2,700 patients have benefitted from the DEFINITE Care programme. Preliminary data showed a 40 percent reduction in major LEA rates and 80 percent reduction in minor LEA rates, as well as significant improvement in diabetes and hyperlipidaemia control among patients. Through the establishment of a DEFINITE Care Registry comprising clinical outcomes, diabetic foot health states, quality-of-life (QoL), patient-reported outcome measures (PROMs), and direct healthcare costs, the cost-effectiveness, cost-utility, and long-term sustainability of the programme can be analysed

Project Category

Care & Process Redesign

Clinical Practice Improvement

Keywords

Lower Extremity Amputation, Multidisciplinary, Diabetic Foot Ulcer

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Lower Extremity Amputation Prevention Programme (LEAPP)

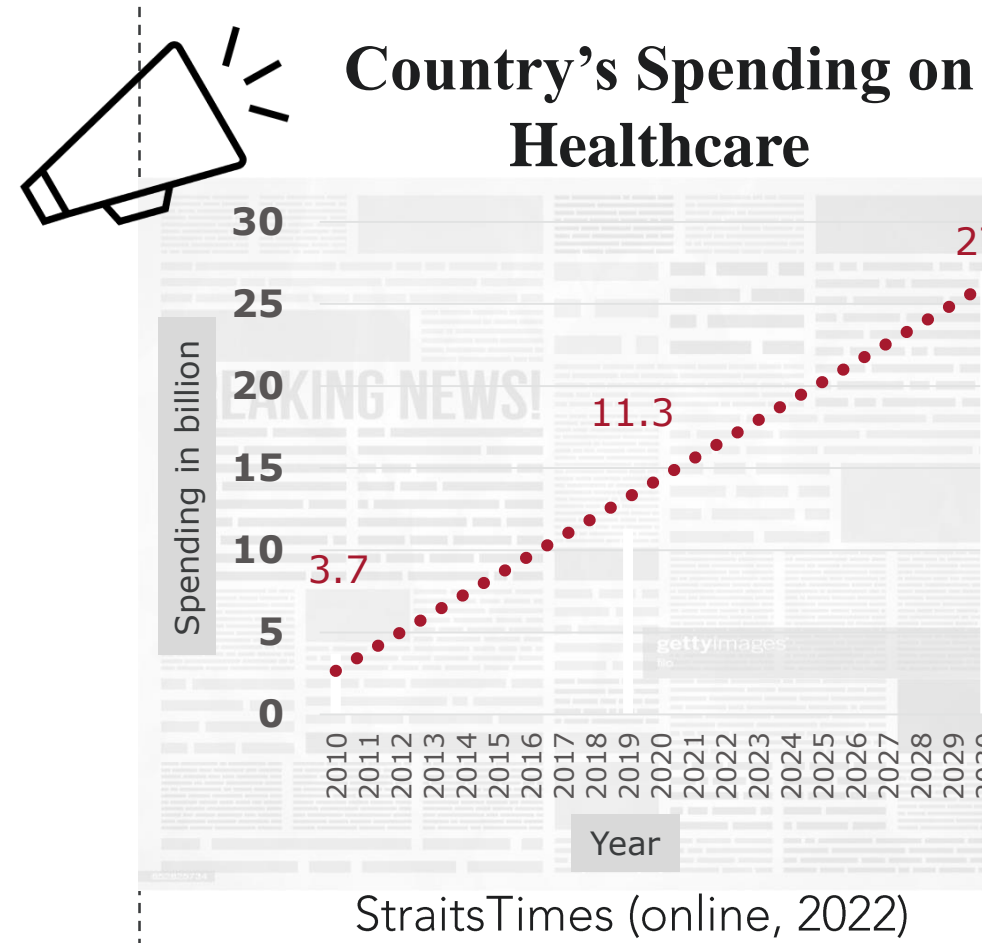
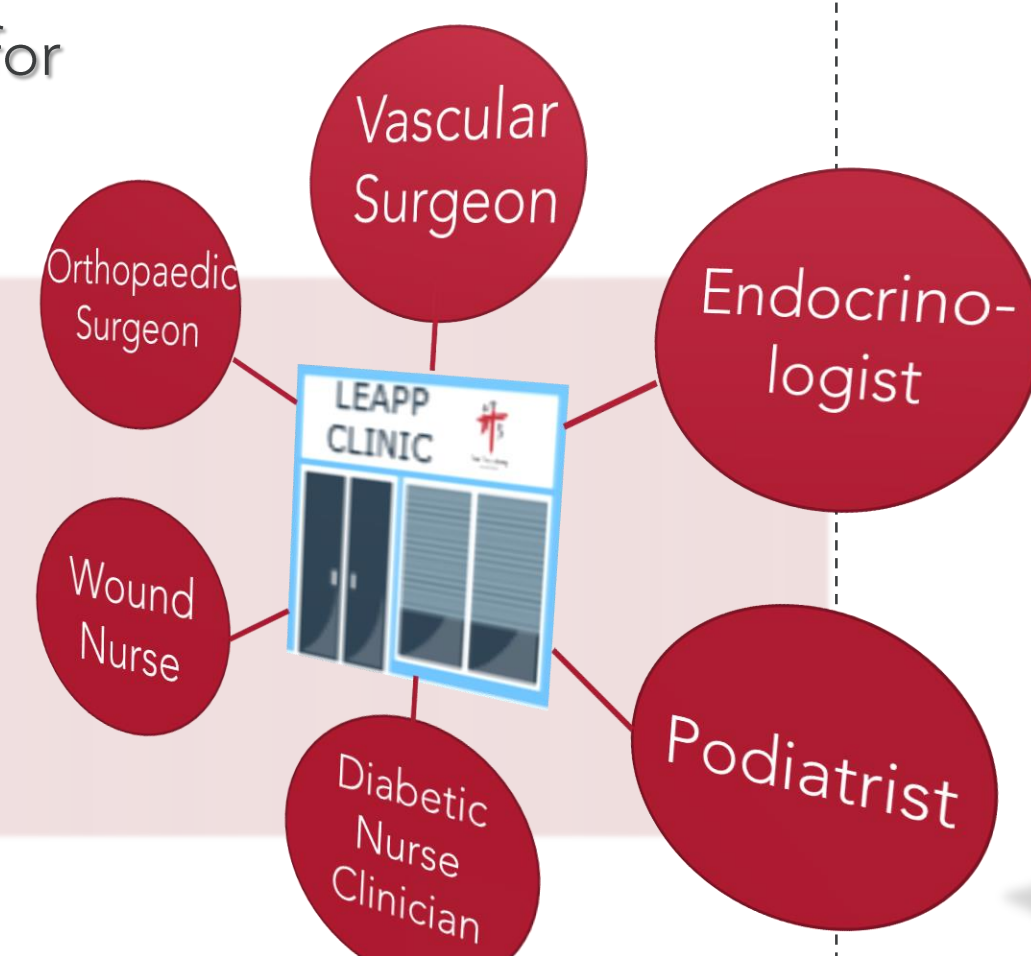
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Impetus for Change and Care Redesign

1 in 9 Singaporean adults suffers from Diabetes Mellitus (DM) and their lifetime risk of developing a diabetic foot ulcer (DFU) is 19% to 34%. Hence, Singapore has a high major lower extremity amputation (LEA) rate, with about 1,500 diabetes-related LEAs each year, i.e. average of 4 per day.

- **85%** of diabetes related LEA are preceded by DFU
- **45% - 85%** of LEA could be avoided with prompt access for multi-disciplinary management of DFU

Multidisciplinary team (MDT) – Intending to reduce irreversible LEAs that impact the quality of life (QoL), TTSH has embarked on a transformation project comprising podiatrists, vascular surgeons and endocrinologists to provide MDT care in managing patients with DFU.



LEAPP aims to provide a holistic and structured MDT approach in the management of DFU which can reduce DFU-related complications, infections, and amputation rates through individualised case discussions between the multiple disciplines which enable the optimisation of patient care plans. This translates to the reduction of economic and patient costs, which is essential to contain the country's increasing healthcare costs.

ADKAR Strategy for Change

Awareness	Outreach to stakeholders (present findings and evidence-based studies)
Desire	Generate shared-values
Knowledge	Educate primary care providers; partnerships; research studies
Ability	Routine discussion for all DFU patients recruited for LEAPP programme
Reinforcement	Refresh latest findings and updates with referral sources

Care Redesign Process

Early Access to Coordinated Multi-disciplinary Care

The TTSH LEAPP Clinic referrals are screened by a vascular surgeon thrice a week and patients who fulfil the inclusion criteria are booked into a TTSH LEAPP clinic appointment at the next available date, usually within the next 5 working days. The TTSH LEAPP clinic is held every Tuesday and Thursday mornings, with an average of 12 to 15 patients reviewed at each session. Each clinic session has a vascular surgeon, endocrinologist and two podiatrists reviewing the patients, in conjunction with a diabetic nurse clinician and a wound nurse (Figure 1). Figure 2 depicts the current clinical pathway and inter-relationship between primary and secondary care providers, in the provisioning of direct and fast access to TTSH LEAPP.

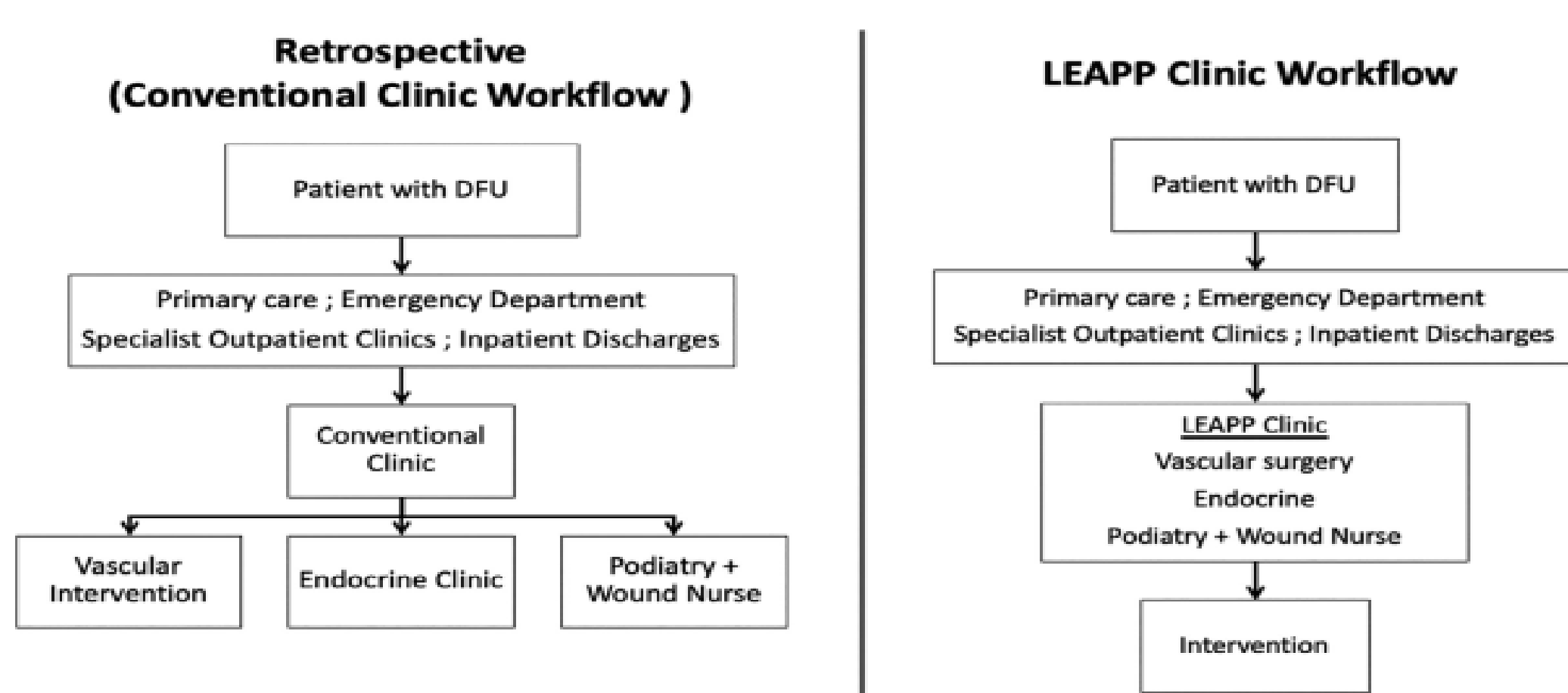


Figure 1: Difference in workflow between conventional clinic vs LEAPP clinic

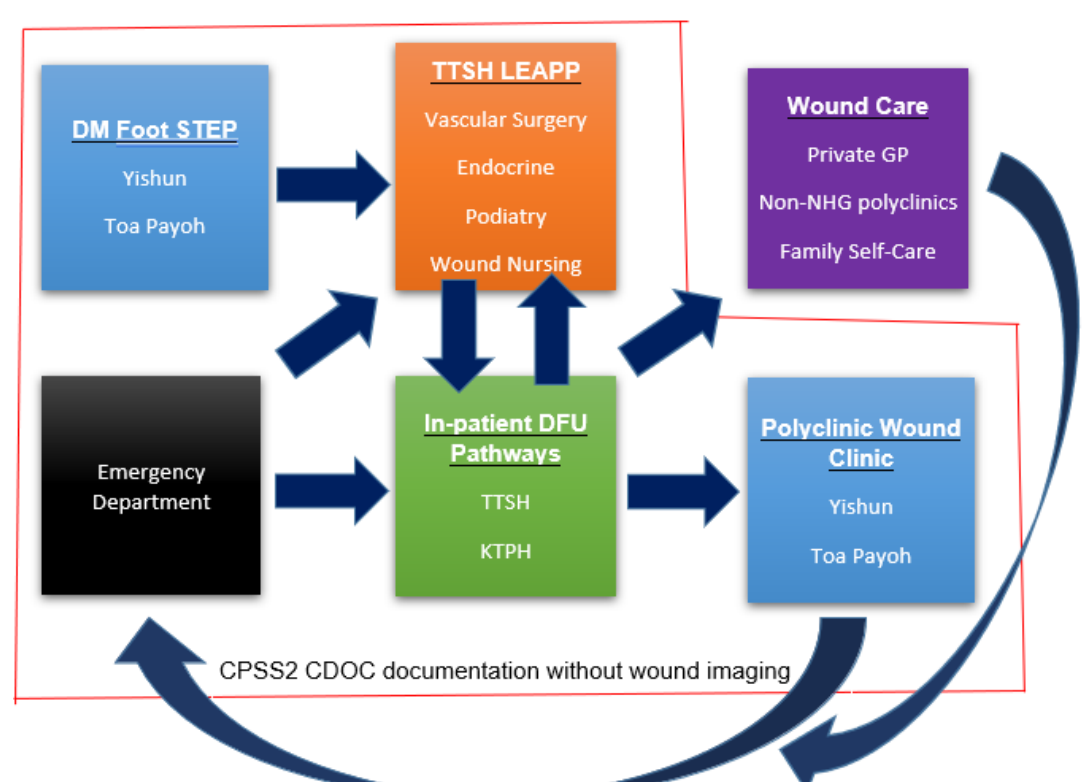
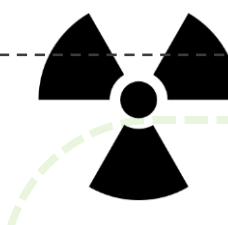
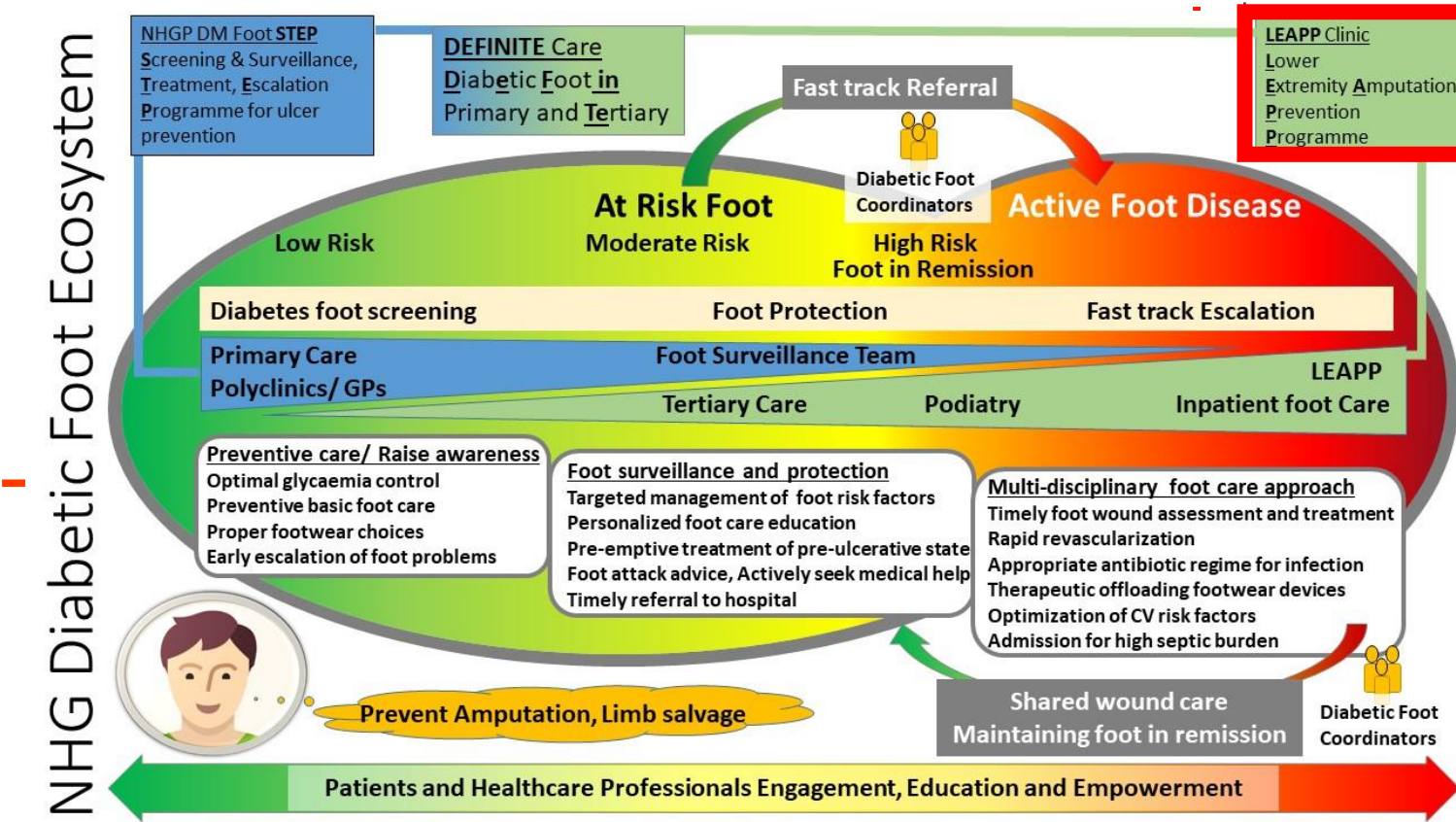


Figure 2: Clinical Pathway for Direct Access to TTSH LEAPP



Fast-track for Active Foot Lesions

- Patients identified to have tissue loss (foot ulcers, or gangrene) during diabetes foot screening or routine diabetes consult are referred with rapid access to LEAPP clinic.
- Timely specialists' assessment and intervention for foot wounds via LEAPP clinic has shown to reduce diabetes-related amputations.



Improved Patient Clinical Outcomes

Additionally, the key interventions at LEAPP clinic include optimisation of glycaemic control and medical risk factors, prompt revascularisation, active wound care, appropriate offloading and delivery of diabetes foot care patient education emphasising on the importance of foot attack.

Results

We adopted the 'Quadruple Aim Model' (Figure 3) to measure the impact of change. The impact and outcomes of LEAPP were measured through a combination of controlled study (Lo et al. [2021]), research, simulation and surveys.

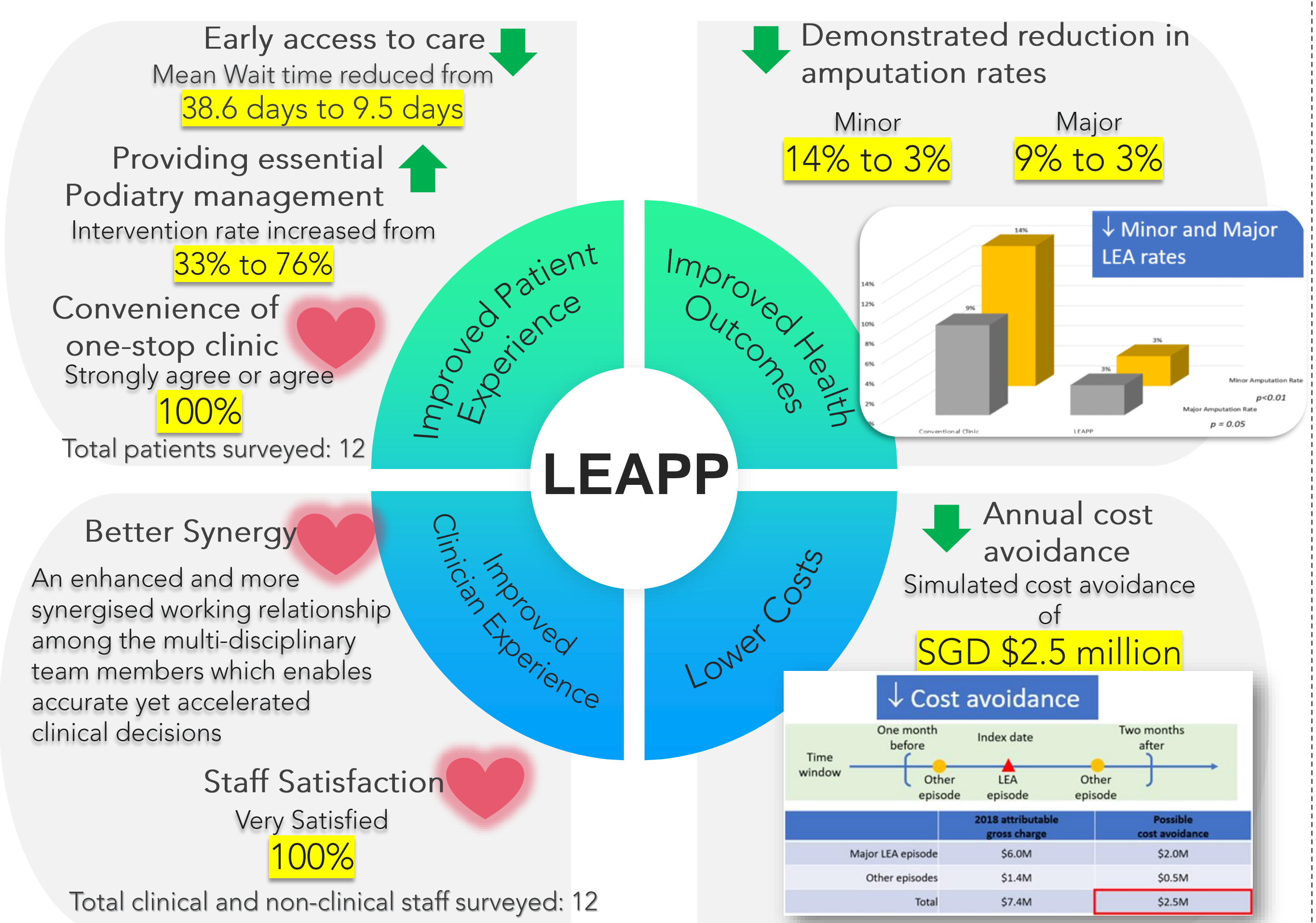


Figure 3: Impact/ Outcome of Change Presented via Quadruple Aim Model

Learning Points

Aspect	Challenge	Solution	Sustainability
Upstream process	Timely referral	<ul style="list-style-type: none"> Increase awareness of LEAPP clinic as a one-stop MDT clinic for diabetes foot ulcers Clinical inclusion and exclusion criteria 	<ul style="list-style-type: none"> Regular engagement and reinforcement extending to primary care and internal stakeholders within the hospital
Manpower Commitment	Coordinated care and team discussion demand higher level of commitment and effort from every individual stakeholders	<ul style="list-style-type: none"> Establish must-have team members for the one-stop clinic and engage the remaining members on need-to basis 	<ul style="list-style-type: none"> Manage stakeholders' expectation
Resource	Small clinic space to place both clinical and rehabilitation examination couches	<ul style="list-style-type: none"> Procured a 2-in-1 clinical and rehabilitation examination couch to save space 	<ul style="list-style-type: none"> Cost-efficient and fuse-free set up critical to easy adoption Seamless allocation of clinic rooms for better workflow and facilitation of in-situ discussions

Conclusion

Serving as a one-stop, rapid access diabetic foot clinic providing time saving and convenience for our patients with diabetic foot ulcers, LEAPP data has also demonstrated significant lower extremity amputations and cost avoidance for our healthcare system. The success of the programme is a testament of how potential multidisciplinary teams could work within the means of available resources to provide cost-effective care to patients.