

THE LIMB SAVERS@JURONGHEALTH

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 **QUALITY**
 **PATIENT EXPERIENCE**

Define Problem, Set Aim

Problem/Opportunity for Improvement

Singapore faces one of the highest age-sex-adjusted rates of diabetes-related lower extremity amputations (LEAs) globally at 12.1 per 100,000 population, compared to the Organisation for Economic Co-operation & Development (OECD) average of 6.4.

The prevalence of diabetes in Singapore is escalating:

- Estimated 660,000 diabetes patients >18 years old in Singapore by 2030
- 25% of patients are at risk of developing diabetic foot ulcers (DFUs)
- DFUs have a 20 times higher risk of LEAs
- Post-amputation: 21.7% mortality within 12 months and only 44.9% remain ambulant after a year.

Consequently, patients with DFUs who have exhausted conventional treatment options face the grim prospect of limb amputation as their only remaining course of action and standard of care.

Aim

To introduce and implement the Transverse Tibial Transport (TTT) technique at Ng Teng Fong General Hospital (NTFGH) to reduce major amputations and preserve limbs in severe diabetic foot ulcer cases.

Establish Measures

Measure	Formula	Baseline (Pre-TTT)
Limb Salvage Rate	$\frac{\text{No of patients recruited for TTT \& avoided LEA}}{\text{Total number of patients recruited for TTT}} \times 100\%$	0%

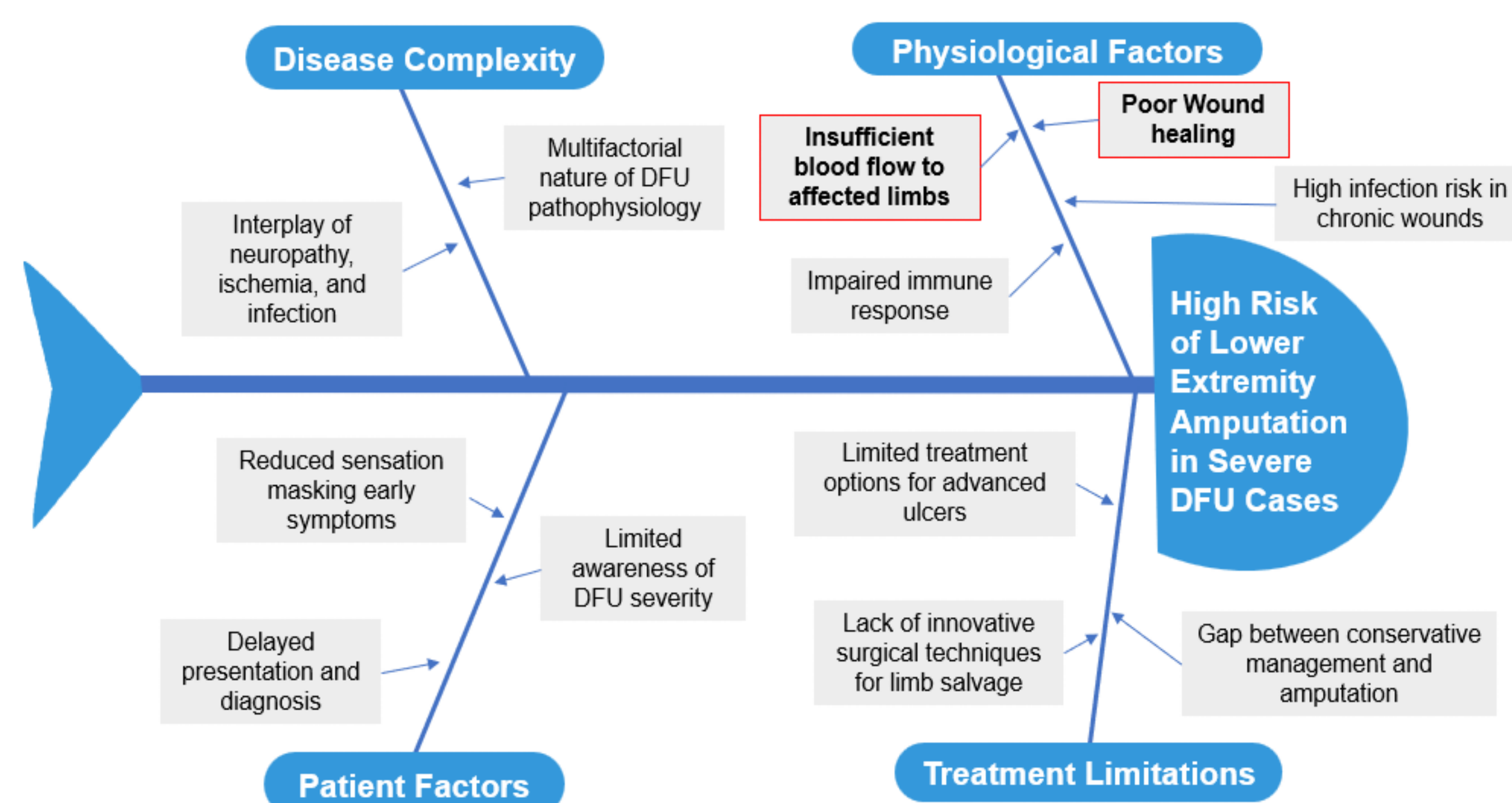
Inclusion criteria:

- Patients diagnosed with diabetic foot ulcers (DFUs)
 - Exhaustion of conventional treatment modalities
 - Facing imminent lower extremity amputation
- All such patients would have undergone amputation as the standard of care.

Analyse Problem

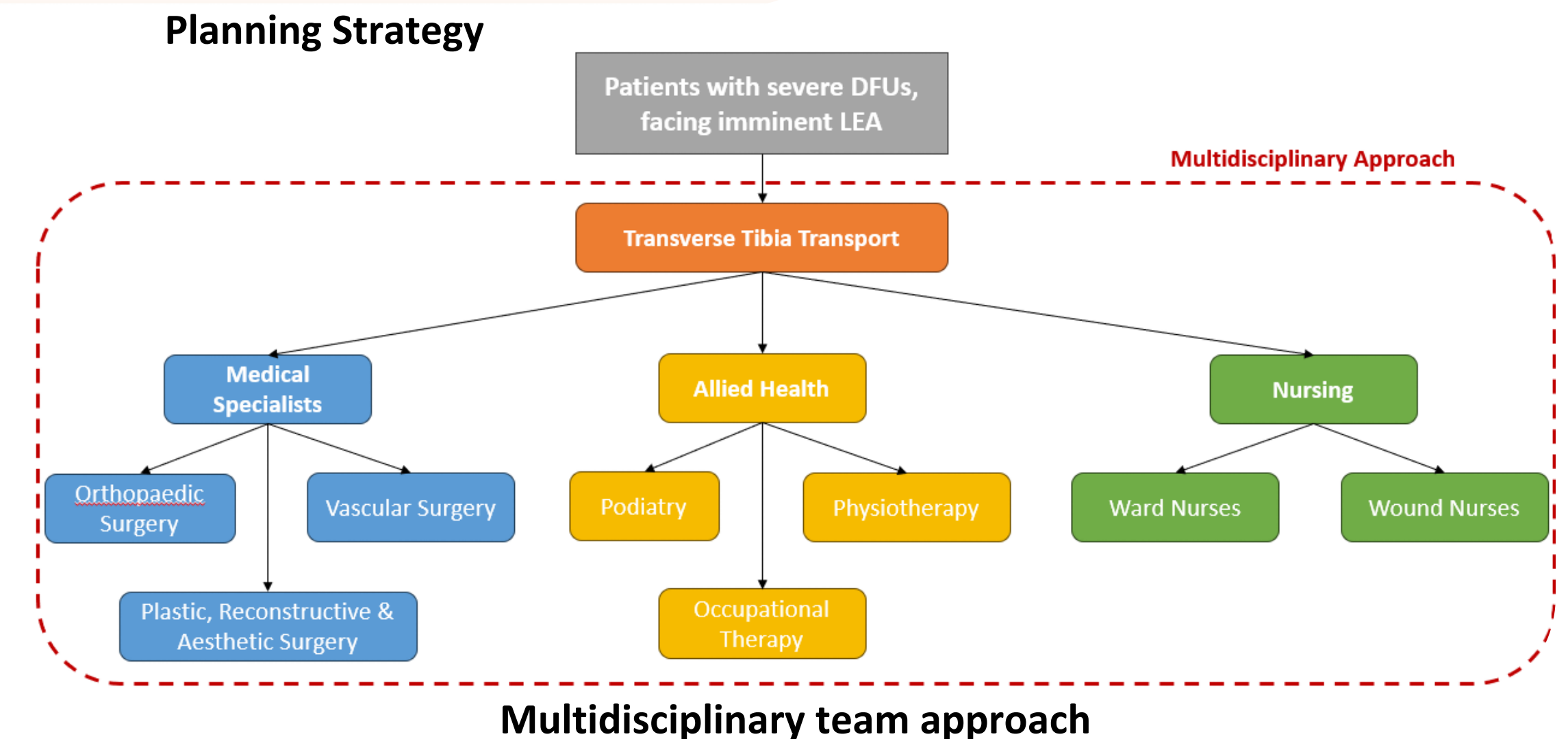
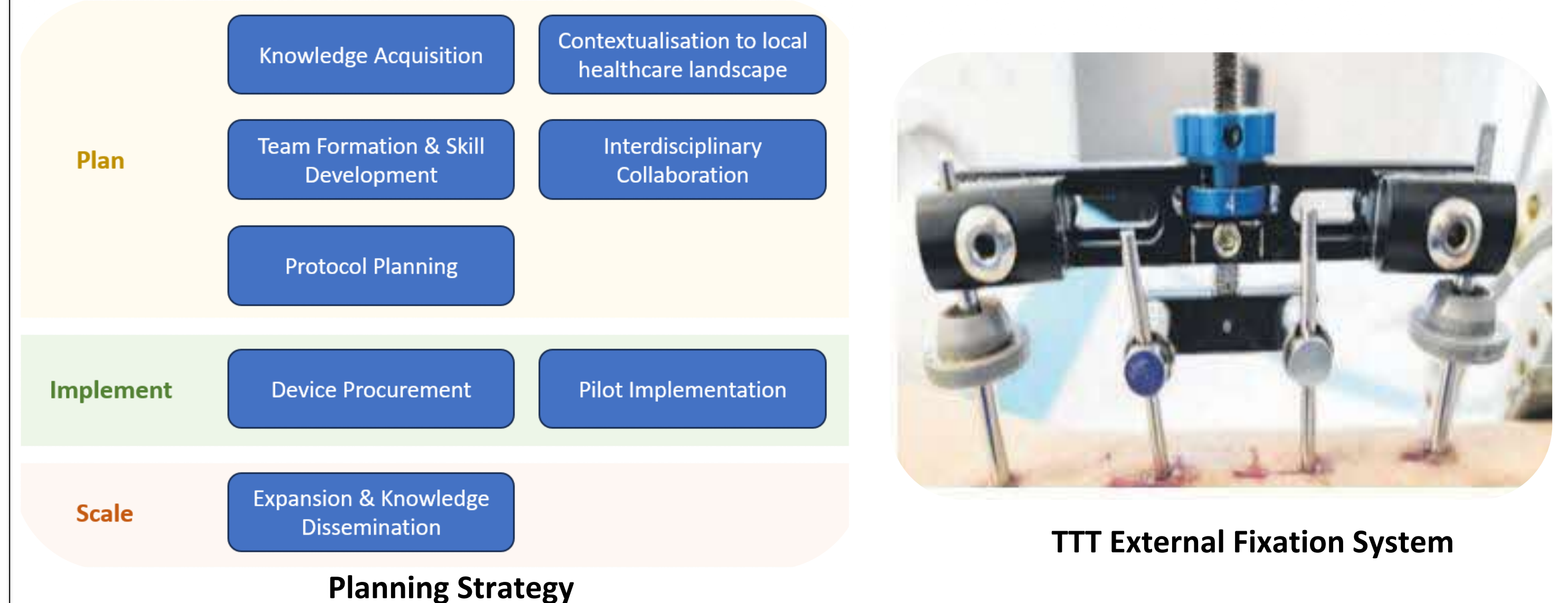
Identify key root causes leading to diabetes-related LEA:

1. Insufficient blood flow to affected limbs
2. Poor wound healing
3. Limited treatment options for severe DFU cases
4. Treatment gap between conservative management and amputation



Select Changes

1. Develop planning strategy to implement TTT technique at NTFGH
2. Develop multidisciplinary team approach
3. Establish patient selection criteria and treatment protocols
4. Procure and obtain regulatory approval for specialised External Fixation System from Health Sciences Authority (HSA) of Singapore



Test & Implement Changes

1. **Limb Salvage Success Rate**
 - Pre-TTT: 0% (All patients facing imminent LEA)
 - Post-TTT (May-Dec 2024): 100% (11 out of 11 patients)
2. **Patient Outcomes**
 - Improved mobility and functional independence
 - Enhanced quality of life and psychological well-being
3. **Cost-Effectiveness (Preliminary)**
 - Avoided costs:
 - Subsequent surgical procedures
 - Extended post-operative care
 - Prostheses
 - Reduced ICU utilization
4. **Societal Impact**
 - Potential for patients to return to gainful employment
 - Reduced burden on healthcare system

Item	Estimated Cost per Patient	Number of Patients	Total Potential Savings
Prosthetic Limb	SGD\$18,000 - SGD\$20,000	11	SGD\$198,000 - SGD\$220,000

Spread Changes, Learning Points

TTT has demonstrated remarkable success since its implementation at NTFGH. From May to December 2024, all 11 patients facing imminent LEA were successfully treated, achieving a 100% limb salvage success rate. This innovative approach has already begun to spread, with a total of 24 cases treated in Singapore, and Woodlands Health and Changi General Hospital adopting the technique for 4 and 2 cases, respectively.

Key learnings:

- Multidisciplinary collaboration is crucial for successful implementation of complex innovative techniques like TTT.
- Innovative surgical approaches can dramatically improve outcomes in cases previously considered untreatable.
- Looking beyond traditional Western medical practices can yield valuable solutions, as demonstrated by TTT's origins in Chinese medicine.
- Singapore's unique position bridging Eastern and Western medical traditions offers opportunities for further innovation.
- Rigorous evaluation, including cost-effectiveness studies, is essential to quantify the full impact of new techniques and guide future implementation.