Project Title

Digitising the Process of Customised Offloading Insoles for Diabetic Patients with Active Plantar Foot Ulcers

Project Lead and Members

Project lead: Cheong Keet Yeng

Project members:

- Leighton Cheng
- Michelle Lai
- Johari Redzwan
- Melissa Phua
- Khalid Anuar

Organisation(s) Involved

Tan Tock Seng Hospital (TTSH) Podiatry Department and BioLab (Australia)

Project Period

Start date: 05-2018

Completed date: 09-2018

Aims

- To improve the turnaround time for fabricating a pair of customised offloading insoles from 3 weeks to 2 weeks in order to enhance diabetic foot ulcer healing
- To eliminate the need to block off clinician time for in-house plaster cast modifications

Background

Customised offloading insoles reduce excessive pressures over diabetic plantar foot ulcers to ensure optimal wound healing. However, customising this device requires a long, manual and labour-intensive process. In TTSH Podiatry Department, the average turnaround time (TAT) for a pair of manually fabricated customised insoles is

approximately 3 weeks (20.7 days). This long TAT translates to patients not receiving their offloading insoles earlier, which increases the risk of wound, infection and amputation. There is also a need to re-work for misplaced or broken plaster casts and the outcome of the final device is dependent on the hand skills of the Podiatrist and Technician (no standardised objective manufacturing process).

Methods

A team comprising of Podiatrists, Technician and Operations Executive was formed to study the causes of the high TAT. We utilised quality improvement tools including a fishbone diagram and a Pareto chart. From the findings, we implemented an innovation process to digitise our manual process. We adopted available technology of an iPad 3D-scanner and worked closely with our industry partner (Biolab) for a protocol-based prescription. We traced and compared the TAT of customised insoles fabricated manually by our Technician over the last 4 months prior to the implementation of digitisation and those by Biolab over the next 4 months.

Results

The turnaround time for fabricating a pair of customised insoles improved from 20 days to 7 days after digitisation. The digitised process with 3D-scanning and protocol-based prescription showed superiority to the manual handcrafted process in reducing peak pressures for offloading plantar foot ulcers. Other positive outcomes include manpower savings, less material wastage and less storage space. Digitisation has disrupted the conventional process. iPad 3D-scanners and protocol-based software can now be used remotely at any location or settings without the need for a resource intensive setup or support.

Lessons Learnt

Successful digitisation in Healthcare includes electronic medical records, monitoring devices etc. This project has shown the possibility of other aspects of clinical practice adopting available technology to digitise their processes. Engaging in regular discussion with our

industry partner was also crucial in ensuring standardisation of the scanning and prescription process for the fabrication of accurate end products.

Conclusion

The successful digitisation process of customised offloading insoles for diabetic patients with plantar foot ulcers has now been a standard practice for the past 1 year. There are plans to procure more iPad scanners to reduce the time taken to obtain foot scans.

Additional Information

2019 NHG Quality Improvement Award - Innovation in Healthcare (Best Award)

Project Category

Process Redesign

Keywords

Process Redesign, Technology, MedTech, Quality Improvement, Improvement Tool, Turnaround Time, Cost Savings, Manpower Savings, Podiatry, Tan Tock Seng Hospital, BioLab Australia, Foot Orthoses, Diabetic Foot Ulcers, Offloading Insoles, Fishbone Diagram, Pareto Chart, 3D Scanning, Protocol-Based Prescription

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Digitising the Process of Customised Insoles for Diabetic Foot Ulcers

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Mission Statement

- Project aim: To improve the turnaround time (TAT) for fabrication of customised offloading insoles from 3 weeks to 2 weeks in order to enhance diabetic foot ulcer healing
- Stretch goal: To improve this TAT to 1 week
- Patient cohort: Patients with an active diabetic plantar foot ulcer
- Include time frame for completion: May 2018 to September 2018
- Project is consistent with organisation (Better people, better care, better community): Innovation enables our staff to adopt and integrate latest technology to our work process; thus putting them in the forefront of digital transformation. This digital transformation would create better value, delivery and quality of care for patients.
- Department's strategic aim: To deliver value-added care to patients

Team Members

	Name	Designation	Department
Team Leader	Cheong Keet Yeng	Senior Podiatrist	Podiatry
Team Members	Cheng Ren Qin Leighton	Senior Podiatrist	Podiatry
	Michelle Lai Shi Eu	Senior Operations Executive	AHS&P
Facilitators	Melissa Phua	Assistant Head of Podiatry Service, Principal Podiatrist	Podiatry
	Khalid Anuar	Head of Department	Foot Care & Limb Design Centre

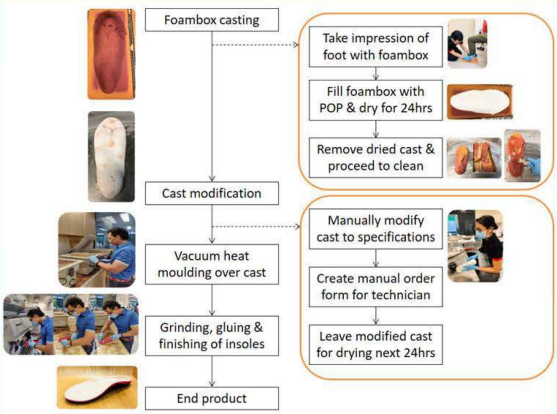
Evidence for a Problem Worth Solving

- Customised offloading insoles reduce excessive pressures over diabetic plantar foot ulcers to ensure optimal healing of the wound
- However, customising this offloading insoles requires a long, manual and labour-intensive process

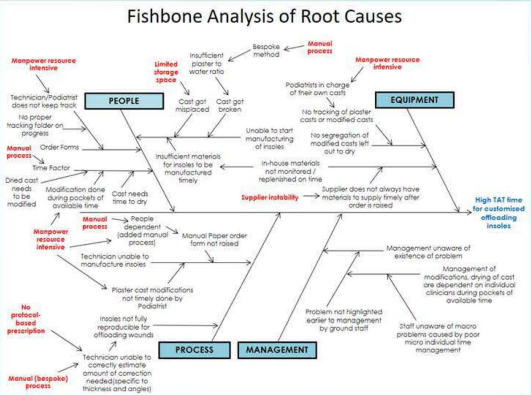
Current Performance of a Process

- Mean TAT is approximately 3 weeks. If therapeutic outcomes from offloading are not achieved earlier, wound deterioration may occur
- Need for re-work if plaster casts are damaged or misplaced

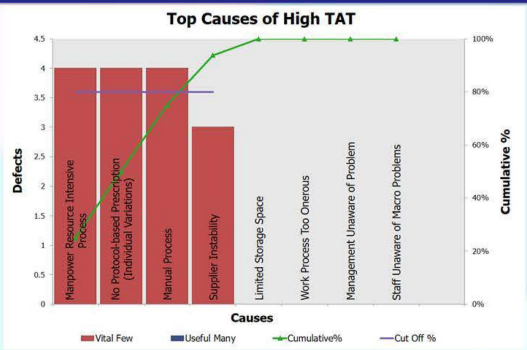
Flow Chart of Process



Cause and Effect Diagram

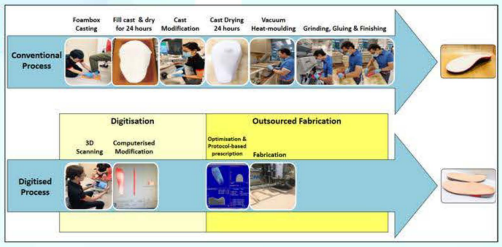


Pareto Chart

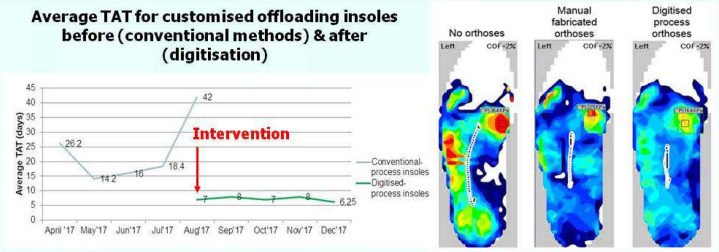


Implementation

PROBLEM	INTERVENTION & DATE OF IMPLEMENTATION
Conventional process which is resource-intensive was not able to cope with high workload and the need for shorter TAT	1/8/2017: We adopted available technology of an iPad 3D-scanner and digitized our work process through innovation. We worked closely with an industry partner for a protocol-based prescription



Results



1. The TAT improved from an average of 20 days to 7 days
2. The digitised process with 3D-scanning and protocol-based prescription showed significant superiority to the manual handcrafted process in reducing peak pressures for offloading
3. Digitisation has disrupted the conventional process. iPad 3D-scanners & protocol-based software can now be used remotely at any location / settings without need for a resource-intensive setup or support

Cost Savings

- Accelerated wound healing translates to cost savings for patients in terms of medical care and earlier return to work
- Manpower savings
- Eliminated need for re-work if plaster casts get misplaced or damaged
- Savings on material wastage (Foam boxes, forms, plaster of Paris, raw materials)
- Eliminated need for storage space of plaster casts and raw materials

Problems Encountered

- Initial apertures created in the digital scans/files to offload the ulcer site did not correspond to the ulcer location when patient weight-bears. This lead to a delay in dispensing the customised offloading insoles if the podiatrist was unable to remedy the device on the spot. We have overcome this problem by working with our industry partner and re-adjusting the protocol-based prescriptions/instructions

Strategies to Sustain

- The successful digitisation process of customising offloading insoles for diabetic patients with active plantar foot ulcers has been a **standard practice** for the past 1 year
- **Clinical Indicators** are tracked for these group of patients
- There is constant engagement with our industry partner for the **quality & accuracy** of the fabricated devices
- **Cost** of outsourcing and technology is minimal due to savings to manpower costs/time, materials and re-works. Digitisation has further added **value** to patients in terms of quality and TAT
- There are plans to procure more iPad scanners to reduce the time taken to obtain foot scans