

Reducing the Incidence of Inadequate Bone Marrow Trephine Samples

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Mission Statement

To increase the mean trephine length done by advanced internal medicine residents and general medicine resident physicians from a baseline of 1.0cm to 1.5cm in 6 months

Team Members

	Name	Designation	Department
Team Leaders	Dr Eugene Fan Bingwen	Consultant	Haematology
	Dr Chow Minyang	Consultant	General Medicine
Team Members	Dr Christian Aledia Gallardo	Principal Resident Physician	Haematology
	Dr Brendan Jonathan Chin Chien Chou	Senior Resident	General Medicine
	Ms Wendy Lim Siew Lian	Senior Medical Laboratory Scientist	Haematology Lab
	Ms Nurshalisa Binte Sariff	Medical Laboratory Technologist	Haematology Lab

Facilitator / Advisor: Adj Asst Prof Ho Yong Howe (Senior Consultant, Pathology)

Sponsors:

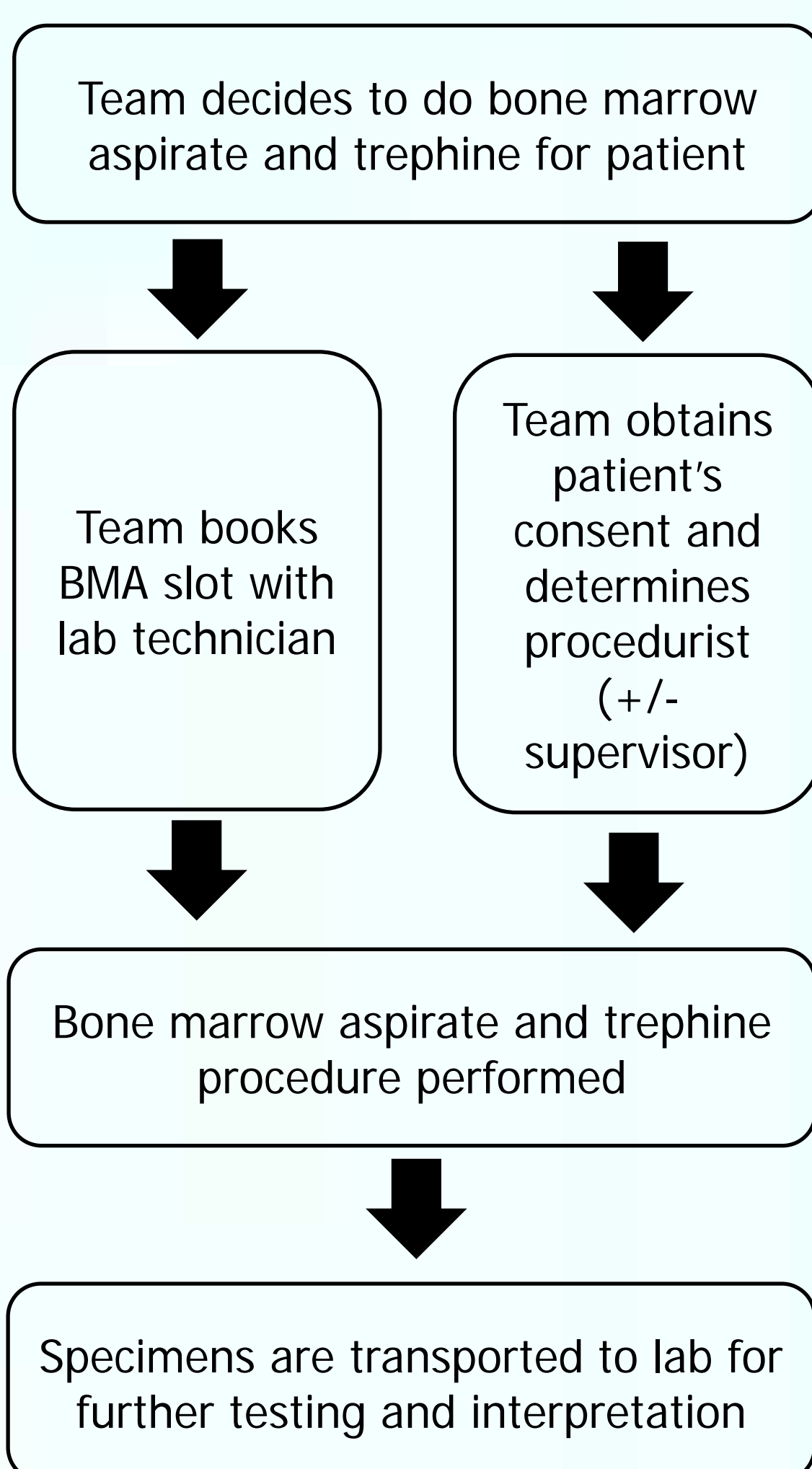
- Adj Asst Prof Sampath Venkata Sreekanth (Head, Department of Haematology)
- A/Prof Jackie Tan Yu-ling (Head, Department of General Medicine)
- Dr Nihar Pandit (Program Director, Advanced Internal Medicine (AIM) Senior Resident Program)

Evidence for a Problem Worth Solving

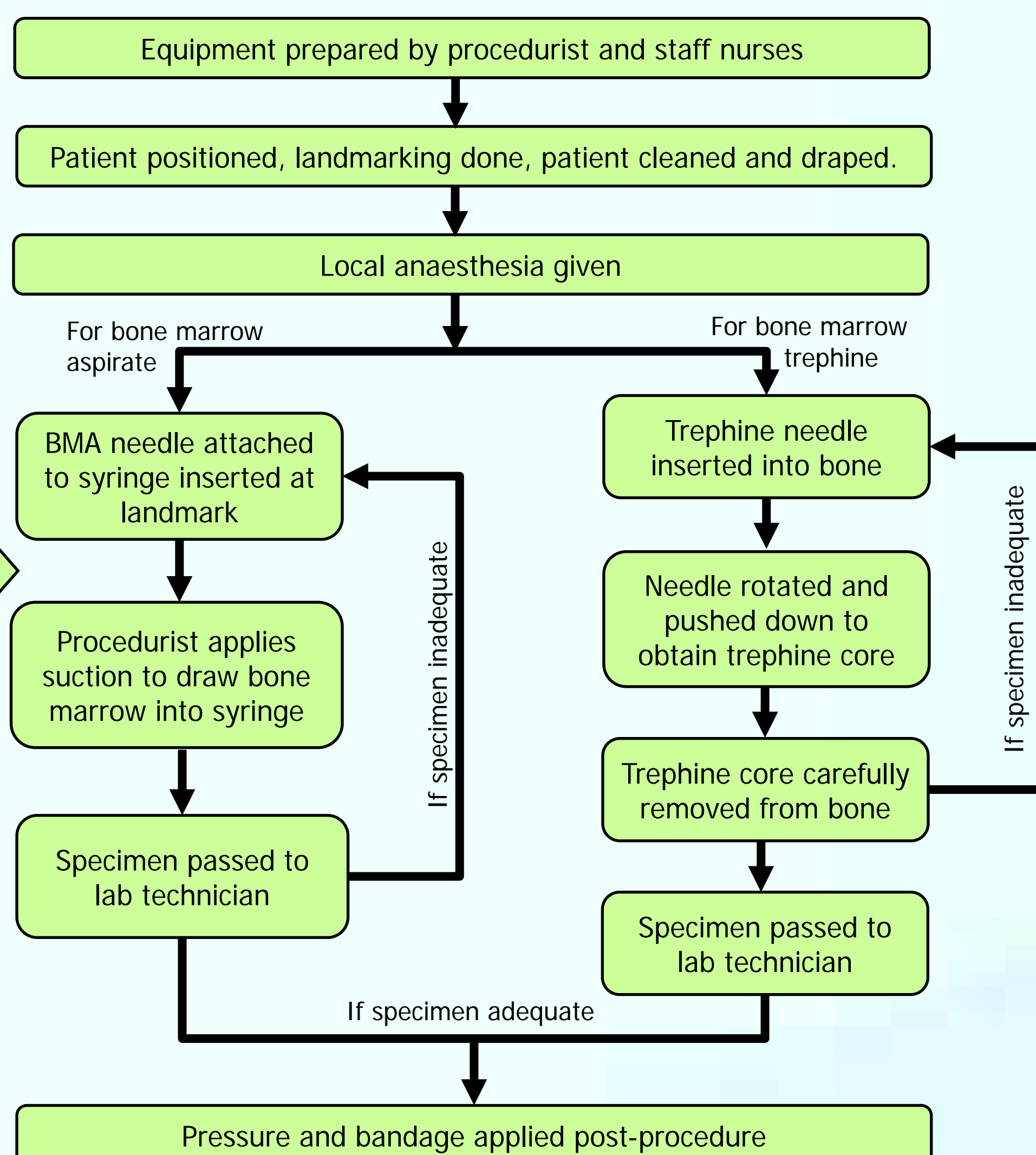
A bone marrow aspirate and trephine is an invasive procedure to obtain histological and molecular diagnosis of haematological problems. A trephine is a core of bone marrow from which histology is determined. According to literature, an ideal trephine length is 1.5 to 2cm. If the trephine length is too short, there will be diagnostic difficulties. The median trephine length from BMAs done by Haematology is 1.5cm with a median number of attempts of 1. However, the median trephine length from non-haematology specialists is 1.0, far below the required 1.5cm, and the median number of attempts per procedure is 2. Prior to our initial CPIP workshop, we collated data of the average length of trephine per month done by General Medicine (GM) Senior Residents (SRs) / Resident Physicians (RPs). This averaged about 1.0cm.

Flow Chart of Process

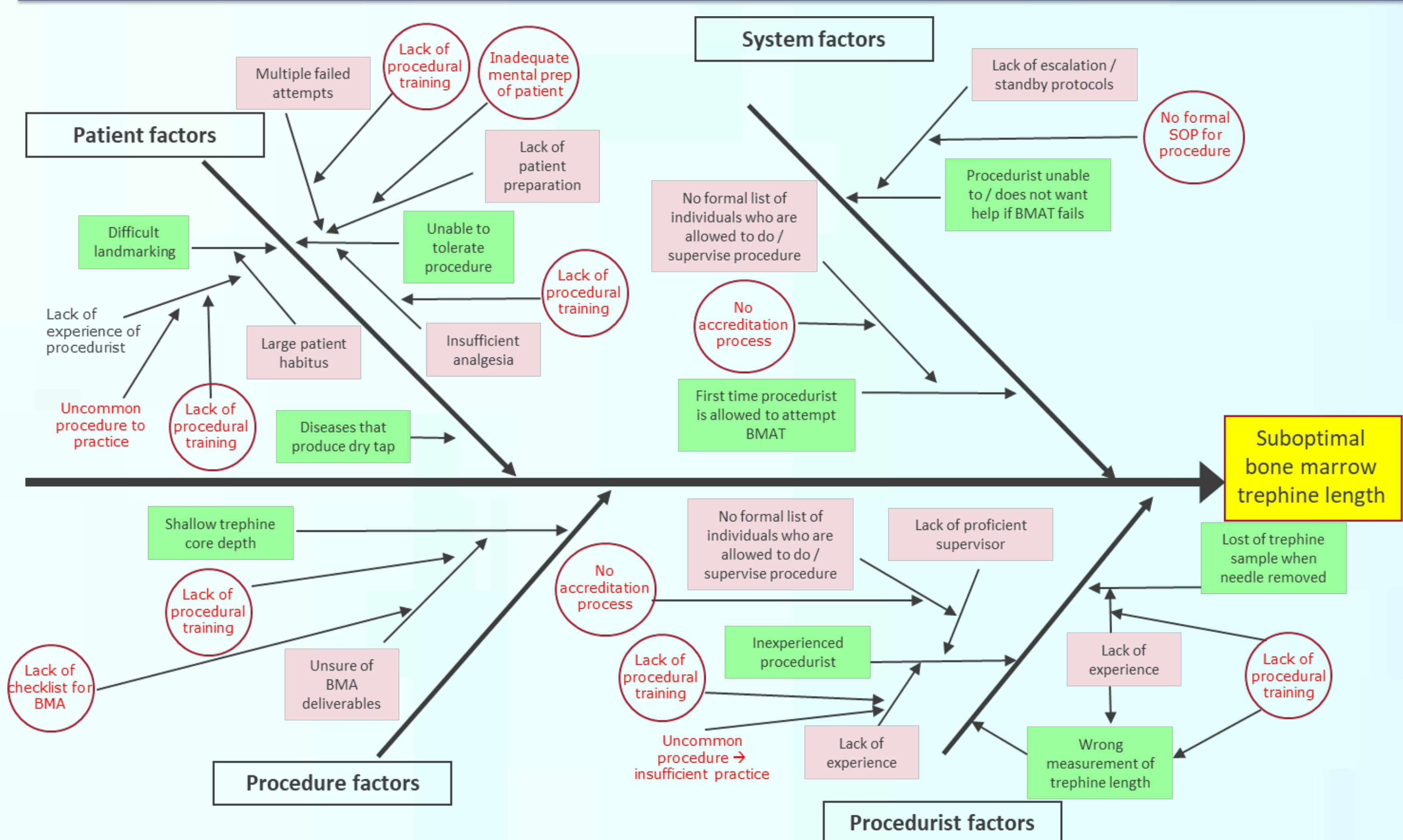
MACRO FLOW



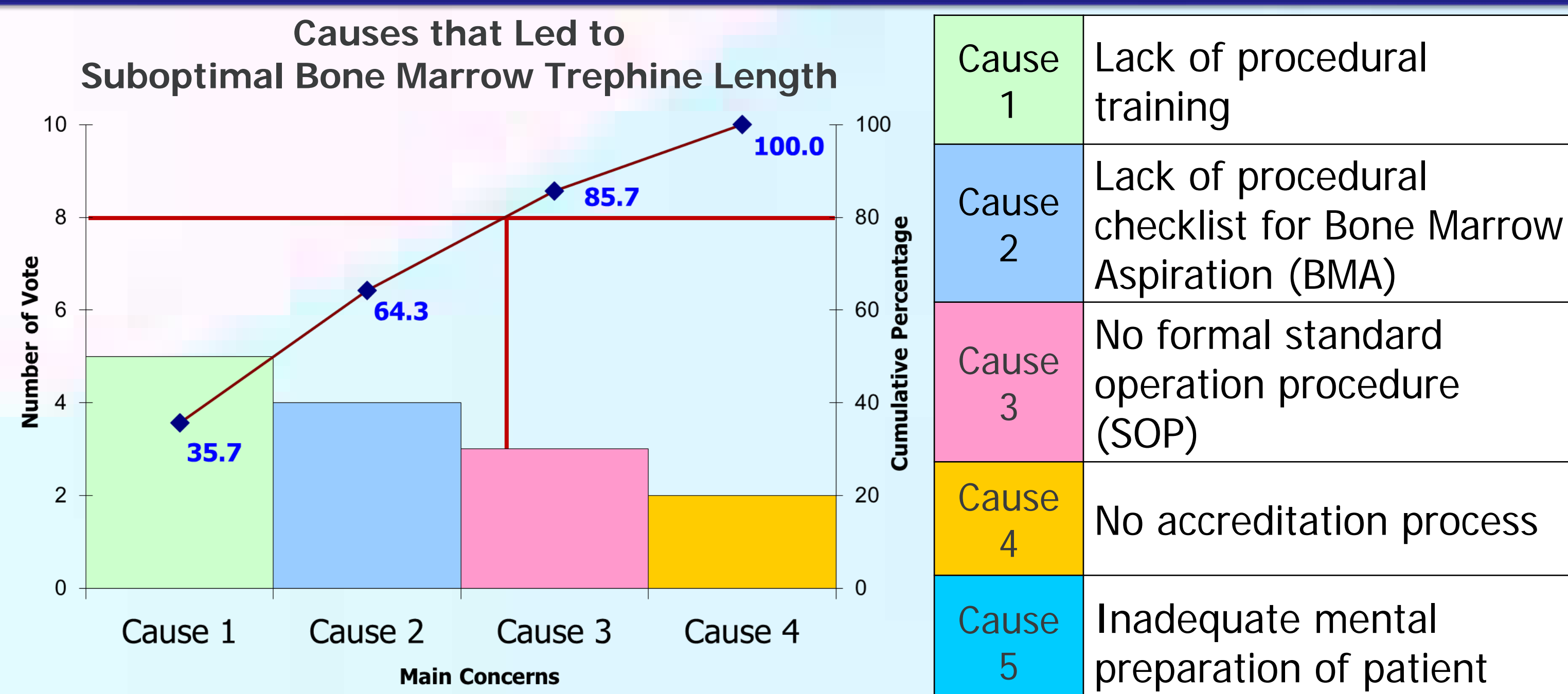
MICRO FLOW



Cause and Effect Diagram



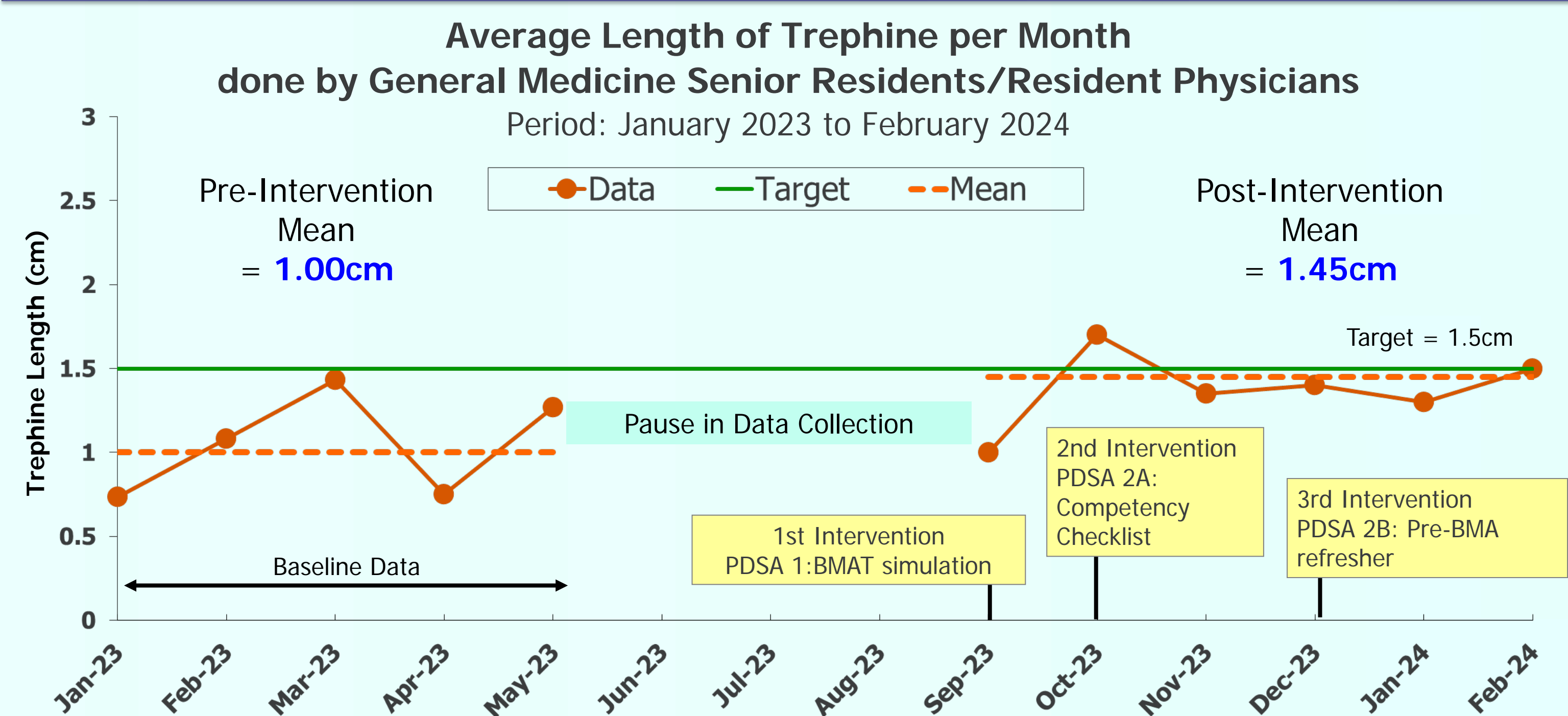
Pareto Chart



Implementation

CAUSE	INTERVENTION	DATE OF IMPLEMENTATION
Cause 1: Lack of procedural training	PDSA 1: Bone marrow aspiration and trephine biopsy (BMAT) simulation training for all GM Senior Residents and Resident Physicians	BMAT Simulation 1 st Training: 14 Sep 2023 2 nd Training: 23 Sep 2023
Cause 2: Lack of procedural checklist for Bone Marrow Aspiration (BMA)	PDSA 2A: Competency checklist written and implemented in Bone marrow aspiration (BMA) simulation assessment PDSA 2B: Pre-BMA refresher video for Procedurists and Supervising Doctor	15 Oct 2023 1 Dec 2023

Results



Cost Savings

Trephine Biopsy Panel Cost	\$341
Laboratory Tech	\$198
Ward charges for disposables / marrow needle	\$69
Aspirate / Flow Cytometry / Cytogenetics not factored in	Wide variation depending on order
Cost of 1 hour for 1 doctor, 1 nurse if procedure needs to be repeated	\$220
Cost of 1 suboptimal trephine	Minimum \$828
Cost savings if 12 suboptimal GM trephines per year are prevented	Minimum \$9936 excluding repeat cost of advanced testing

Lessons Learnt

- Interventions executed take time to show results
BMAT is an occasional procedure, will need longer run time for PDSA and to collect results post intervention.
- Massive logistics required to execute interventions
Many iterations of interventions prior to roll out, scheduling of intervention execution for best effect and biggest audience.
- Interventions need to be sustainable
Many interventions can increase trephine length immediately, but not many are sustainable, or practical, in the long run.

Strategies to Sustain

- Advanced Internal Medicine (AIM) Chief Resident initiated BMAT simulation, taught by Haematology Senior Resident/Consultant.
- Pre-BMA refresher video, competency checklists have to be readily available.
- Continue monthly audit of BMA trephine lengths by haematology staff