Detailed written description of the innovation

1.0 Blueprint

The innovation design was formed after several meetings with the team members. A detailed plan for the innovation was considered after obtaining feedback from patients, radiographers, and radiologist interviews.

2.0 Prototype Design

The team members analysed the design prototype of the foot positioning device following the four dimensions of prototyping techniques as below.

2.1 Representation

Initially, the team members sketched the design of the foot positioning device on paper as part of constructing the prototype. A series of quick sketches provided general and informative design ideas for the project by considering the objective and target group. The team members adopted the ***rehal*** (book rest) **(Figure 1)** design to form the foot positioning device.

Figure 1: Product design idea adopted from ***rehal*** (book rest)

2.2 Precision

In this product design stage, the team members had a few brainstorming sessions to discuss relevant details, such as the prototype design, materials used and the

place or person that can create the device. **(Figure 2).** Subsequently, the team members collaborated with a carpenter to accomplish the ideas and product design. The first product innovation was made from acrylic plastic, aiming to make the product lighter to ease lifting by the users. The outcome saw a design which was thin, lightweight, and radiolucent. After a few trials with polytrauma patients, unfortunately, this prototype broke, and it was found that the acrylic plastic could also be easily scratched. **(Figure 3)**

Figure 2: Brainstorming sessions by team members

Figure 3: The first product innovation made from acrylic plastic

2.3 Interactivity

The prototype foot positioning device was designed for radiographers' use in polytrauma patients to produce the optimum image quality and assist radiologists in diagnosing the foot X-Ray. After radiographers used the prototype, valuable

feedback and ideas were obtained to improve the product further. Discussions with the carpenter further improved the product design. Subsequently, the team members changed the material from acrylic plastic to wood to ensure robustness. **(Figure 4)**

Figure 4: Carpenter assisting in the product design and making

2.4 Evolution

The team members continuously improved the design prototype throughout the project while maintaining the project's main objectives. The product's final design was a flexible device with a hand holder for use during foot X-Ray, and the product was called "**Flexi Foot**".

3.0 Product Design: Flexi Foot 1

3.1 Design Characteristics

Flexi Foot 1 **(Figure 5)** is smaller, highly durable and stable, and safer for both user and patient than the prototype. Furthermore, it is suitable for Computed Radiography (CR) cassettes (35 x 35 cm) or (35 x 43 cm) and Digital Radiography (DR) detectors. In addition, the new design has a handheld feature and is easily lifted and transported.

Figure 5: Flexi Foot 1

3.2 Technical Specification

- The technical specification of the Flexi Foot 1 Positioning Device is illustrated in **Figure 6**, with details summarised in **Table 1**.

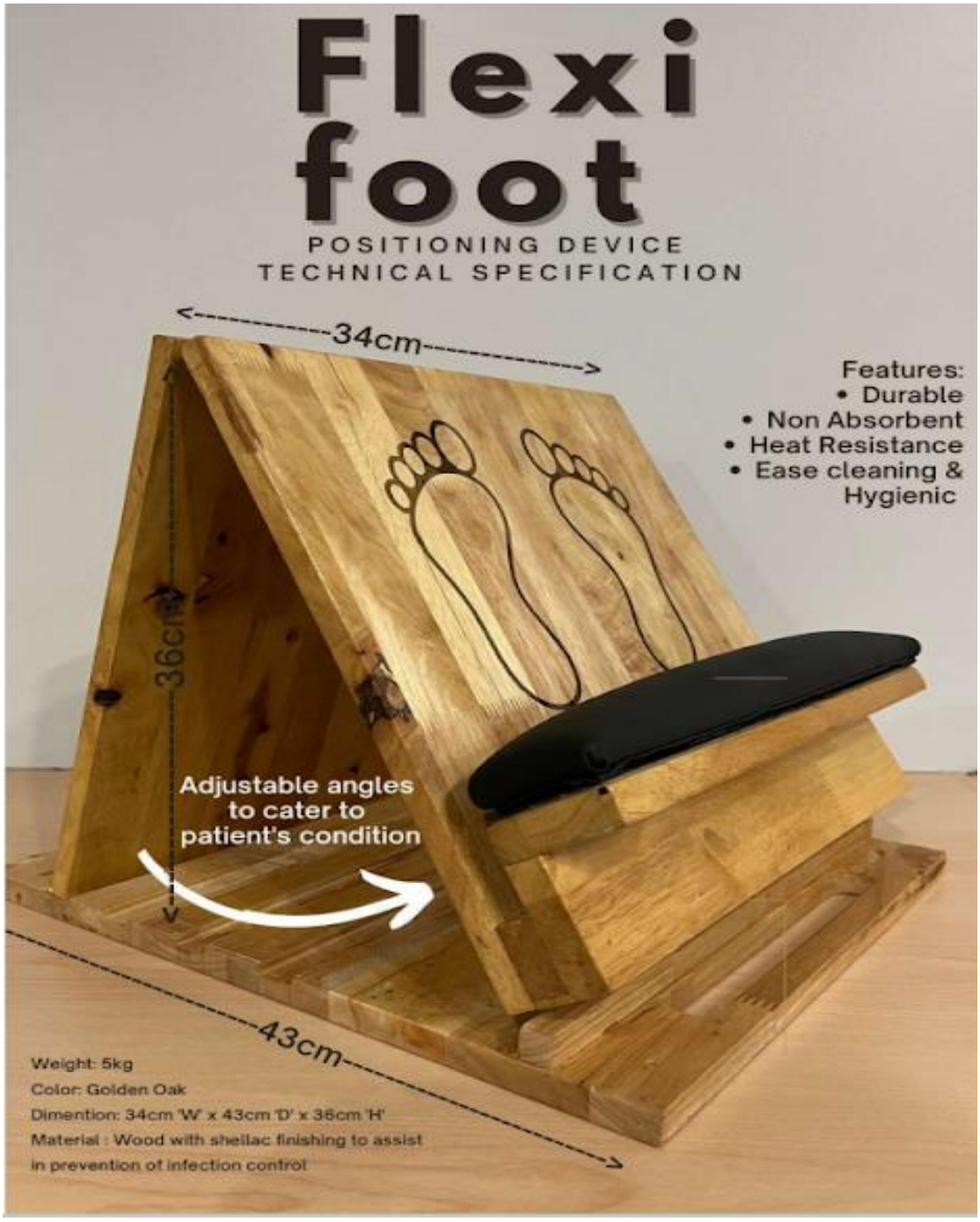

Figure 6: Technical specification of Flexi Foot 1 Positioning Device

Table 1: Technical Details of Flexi Foot 1 Positioning Device

Technical Details	
Product	Flexi Foot 1 Positioning Device
Function	Assist in positioning of foot X-Rays imaging in polytrauma patients
Material	Wood with shellac finishing to assist in prevention of infection control
Dimension	34cm 'W' x 43cm 'D' x 36cm 'H'
Weight	5kg
Color	Golden Oak
Cost	RM300
Function	Foot immobilizer for positioning in the polytrauma patient
	Enhanced comfort level for the patients with the inclusion of sponge material
	Reduced patient movement (control pain management)
Features	Durable, non-absorbent, ease cleaning and hygienic, heat resistant.
Application	Please refer to the information leaflet titled ‘6 Ways to use Flexi Foot Immobilizer’ and the video (QR Code) as illustrated in **Figure 7**

Figure 7: Information Leaflet on Flexi Foot Immobiliser application and video

4.0 Product Design: Flexi Foot 2

Further changes to the Flexi Foot 1 were made. The new version, Flexi Foot 2 Positioning Device **(Figure 8)**, is weighted 3.3 kg, less than 1.7 kg than the previous Flexi Foot 1. The new version is ergonomic for the users. It has a clip opener that assists the Radiographer in indicating which side to open during the positioning of the patient and also to prevent premature opening while lifting as part of the safety feature.

Figure 8: The improved Flexi Foot 2 Positioning Device

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