Australian Government
Department of Health
Therapeutic Goods Administration

Regulation of personalised medical devices (including 3D-printed devices)

Validation aspects of Patient-Matched Medical Devices (PMMDs)

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Presentation Overview

- Definitions – Patient-Matched Medical Devices (PMMDs) and specified design envelope
- Regulatory requirements for PMMDs
- Known challenges with PMMDs
- Technical considerations for PMMD validation
  i. Design envelope schema
  ii. Patient-imaging data
  iii. Identification of worst-case scenarios
  iv. Clinical implementation and usability assessment
  v. Clinical evidence requirements
- Key Takeaways

Definition: Patient-Matched Medical Device*

A **Patient-Matched Medical Device (PMMD)** means a medical device that:

- is manufactured by the manufacturer, within a **specified design envelope**, to match:
  - either or both of the anatomical and physiological features of a particular individual; or
  - a pathological condition of a particular individual

- is designed by the manufacturer (even if the design is developed in consultation with a health professional)

- is manufactured using production processes that are capable of being:
  - either or both validated and verified; and
  - reproduced.

Definition: Specified Design Envelope*

In relation to a **PMMD**, a **specified design envelope** means minimum and maximum dimensions, performance limits or other relevant factors that:

- characterise a medical device for production purposes;
- may be based on a standard device template.

Regulatory requirements for PMMDs

- **How are PMMDs supplied in Australia?**
  - if greater than five devices are supplied in a financial year, they must be included on the ARTG before supply
  - if five or less devices are supplied in a financial year, they are exempt from ARTG inclusion and certification requirements, but must still meet all other regulatory requirements
- Majority of Custom Made Medical Devices (CMMDs) (supplied prior to **25 February 2021**) will meet the PMMD definition
- Transition arrangements for CMMD manufacturers:
  - notify the TGA online (before **25 August 2022**) for accessing the transition arrangements
  - must submit an application for ARTG inclusion by **01 November 2024**

Medical Device ARTG Inclusion Process

Australian Regulatory Guidelines for Medical Devices, step-by-step guidance

1 Risk based classification system

Classification determines minimum conformity assessment procedure(s)

2 Conformity Assessment Procedures

- Quality Management System
- Essential Principles (EPs)
- Certification appropriate to the device class

3 Inclusion in the Australian Register of Therapeutic Goods

4 Post Market Vigilance, Monitoring, Reporting

Known challenges with PMMD validation

- Heterogeneity in device design
- Device design often dependent on the quality (and age) of imaging data
- Multiple parameters included in the specified design envelope
- Multiple worst-case scenarios
- Patient-specific device design not finalised until patient characteristics are available
- Clinical implementation challenges and usability assessments

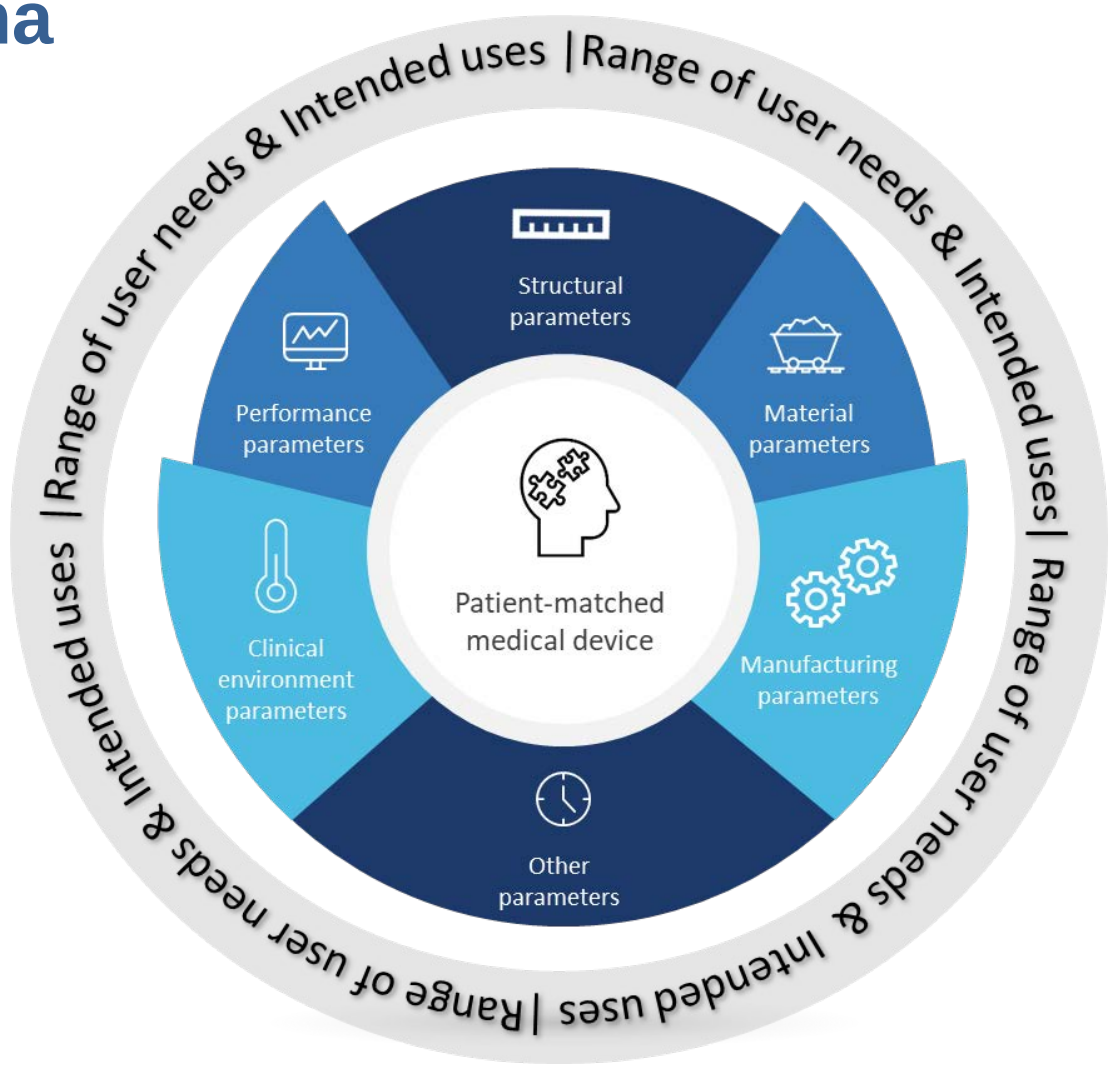
Technical considerations for PMMD validation

- Design envelope schema
- Patient-imaging data
- Identification of worst-case scenarios
- Clinical implementation and usability assessment
- Clinical evidence requirements

One (a): Design Envelope Schema

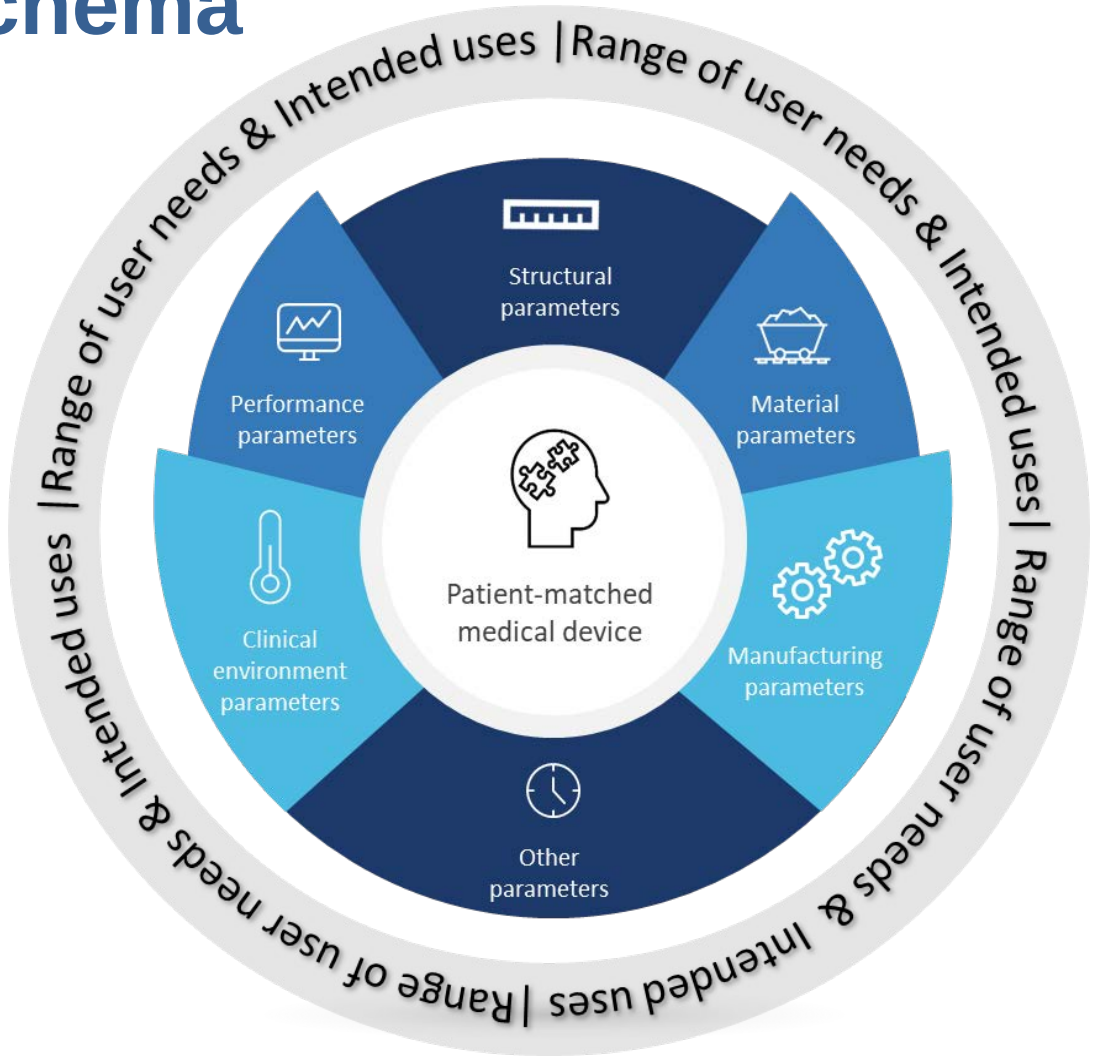
Range of user needs & Intended uses

- Structural parameters
- Material parameters
- Manufacturing parameters
- Performance parameters
- Clinical environment parameters
- Other parameters



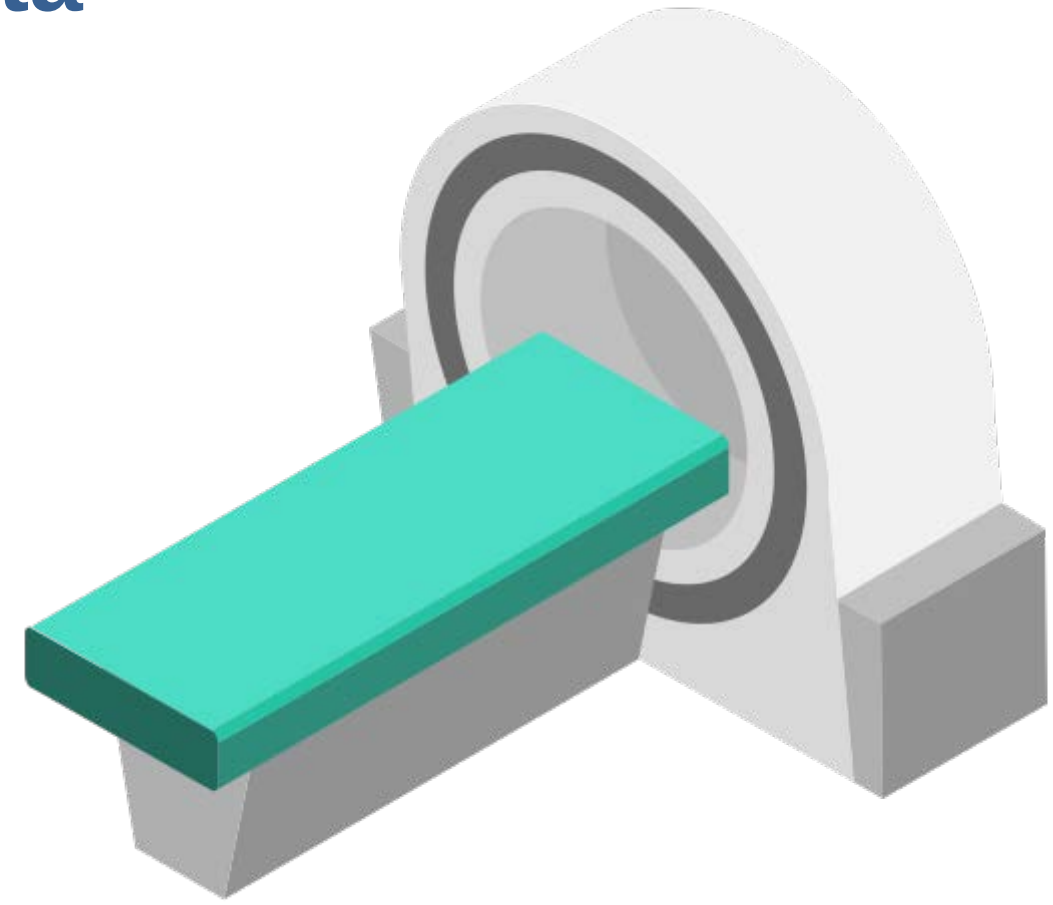
One (b): Design Envelope Schema

- Explicit limits on each parameter
- Categorial versus numerical data
- Reference interval, minimum increment, unit of measurement



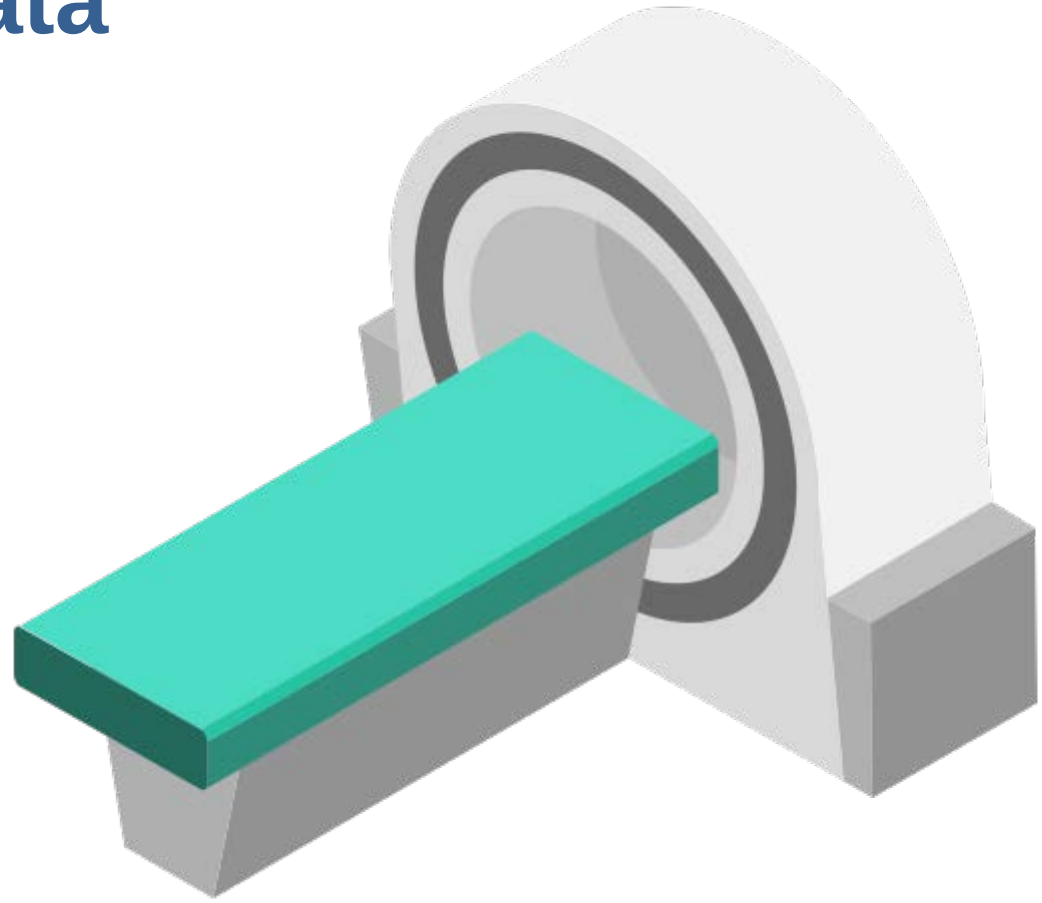
Two (a): Patient-imaging data

- Factors pertaining to imaging modality, data acquisition, and image processing methods
- Minimum requirements for patient-imaging data (for example, field of view, pixel size, slice thickness etc.)
- Verification & validation (V&V) of image processing (manual/automatic) workflow



Two (b): Patient-imaging data

- Minimum requirements for the age of the scan (for example, if the device is indicated for skeletally immature patients, time sensitive pathologies)
- Expiration period for the device – minimising the time between image acquisition and first use in patient



Three: Identification of worst-case scenarios

- Comprehensive risk-management plan (consistent with ISO 14971)
- Worst-case design scenario based on identified risks
- Different worst-case design scenarios for different risks (for example, MR safety, fatigue assessment, usability etc.)
- Generally, higher evidential burden for implantable devices compared with non-implantable
- Justification to be supported by scientific literature, post-market data from comparable devices, non-clinical testing (bench testing, validated computational modelling, etc.)

ISO 14971: Application of risk management to medical devices

Four (a): Clinical implementation & usability assessment

- Compatibility with the anatomy/physiology of the intended recipient is an important consideration for PMMDs
- Surgical guides, special instruments & procedures, labelling and training
- Assessment of patient-prosthesis match

Four (b): Clinical Implementation & Usability Assessment

- Usability risks for all medical devices must be considered in the design and development process
- Pre-market assessment of usability (part of technical documentation)
- Usability assessment with **Real users** conducting **Real tasks** in **Real/Simulated** use environments (consistent with IEC 62366-1)
- Residual risks communicated to the users (via IFU, training etc.)

IEC 62366-1: Application of usability engineering to medical devices

Five (a): Clinical evidence requirements

- Clinical evidence an essential aspect of design validation of medical devices (to demonstrate compliance with the Essential Principles)
- Depth of clinical evidence should be appropriate to the risk classification, novelty and parameters included in the specified design envelope
- Generally, direct clinical evidence will be required for PMMDs commensurate with the risk classification of the device
- Generalisability of evidence: “Worst-case” and “Common-use” scenarios

Five (b): Clinical evidence requirements

- Data from comparable devices may be considered, but the extent of its acceptability depends on how similar subject and comparable devices are with respect to biological, technical and clinical characteristics

- Total product life-cycle approach to ensure ongoing acceptability of residual risks, identify any emerging risks

- For residual risks, post-market clinical follow-up studies with data collected in a way that allows sub-group analyses of design envelope parameters

Key Takeaways

- PMMDs are not exempt from ARTG inclusion (>5 per financial year)
  - transition arrangements available (notification required), relevant certification and application for ARTG inclusion must be submitted by 01 November 2024

- PMMDs supplied in low volume (<5 per FY) exempt from ARTG inclusion and certification requirements; however must meet all other regulatory requirements such as compliance with EPs, adverse events reporting etc.

- Heterogenous; device-design not frozen until patient characteristics are available

- Regardless of risk classification, specified design envelope must be established

Key Takeaways

- If imaging data is used for patient-matching, minimum requirements and workflow V&V for imaging data must be established

- A risk-based approach to the identification of worst-case design scenario(s) within the specified design envelope

- Higher evidential burden if devices are implantable, high-risk, based on novel technologies

Questions

Medical Devices Information Unit (MDIU)

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