



Towards the Establishment of Guidelines for the Credible Practice of Modeling and Simulation in Healthcare

Committee on Credible Practice of Modeling & Simulation in Healthcare
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INTRODUCTION

The role of computational modeling and simulation (M&S) in the development and delivery of healthcare continues to grow rapidly [1-2]. However, the multidisciplinary nature of healthcare practice and biomedical research, combined with the multi-contextual utility and highly diverse maturity of biomedical M&S, present significant challenges to unify credible practice standards and guidelines [3-4]. The Committee on Credible Practice of Modeling & Simulation in Healthcare (CPMS hereafter) [5], including M&S experts from various technical disciplines in academia, industry, government, and healthcare, was formed to address this challenge.

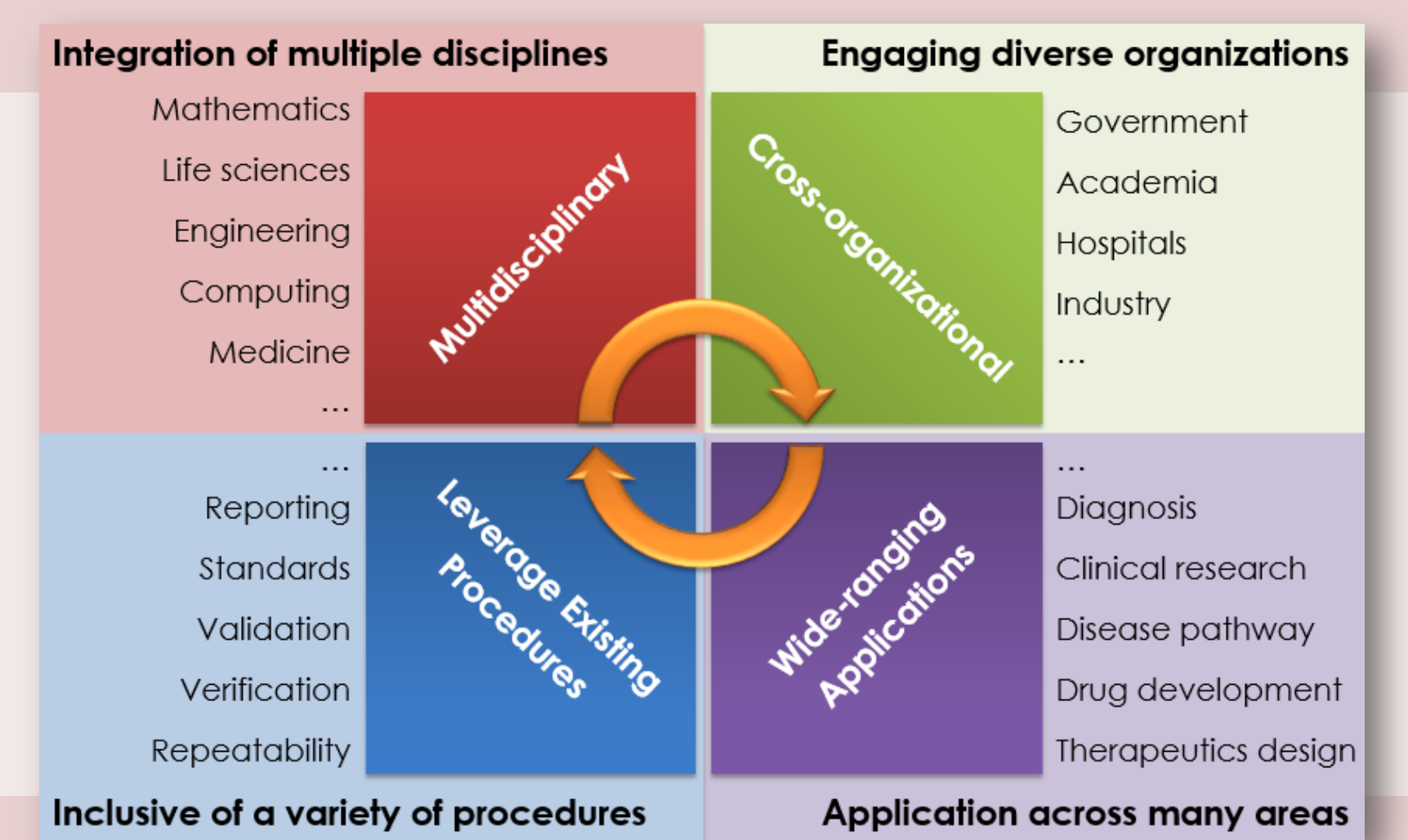
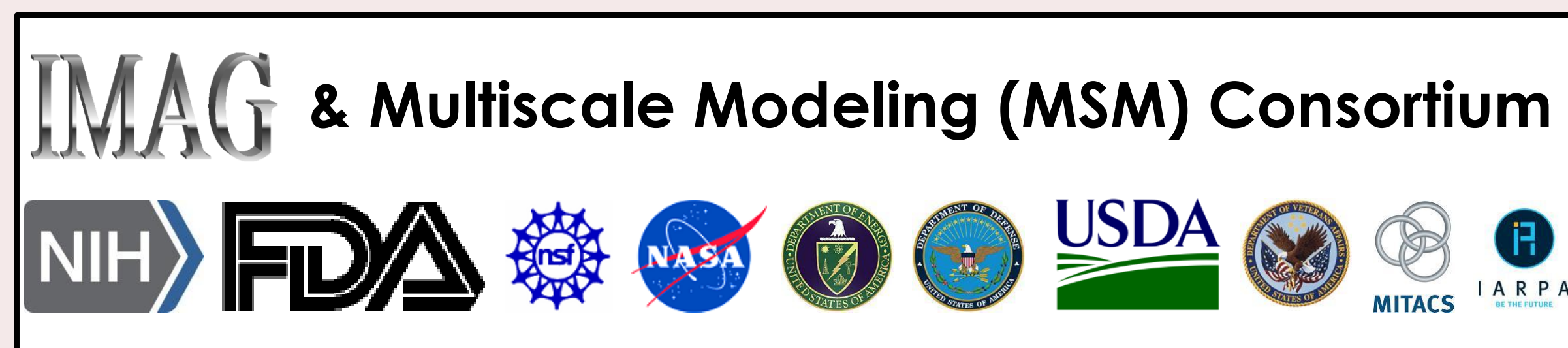
CPMS Overview

Mission Statement

"To establish credible practice guidelines, consistent terminology and a model certification process (proposed), as well as to demonstrate workflows and identify new areas of research for reliable development and application of M&S in healthcare practice and research."

Primary Stakeholders

Computational M&S in healthcare as a whole – mainly driven by research initiatives under the IMAG Multiscale Modeling Consortium



End Products

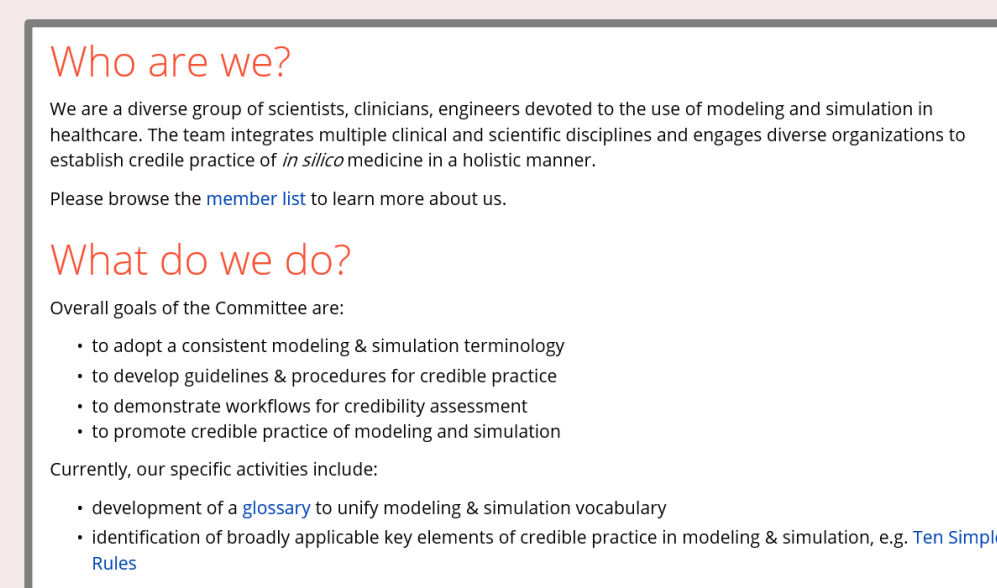
- I. "Guidelines for Credible Practice of M&S in Healthcare"
- II. Proposed model certification process
- III. Identify new areas of research to advance I & II

Approach to Developing End Products

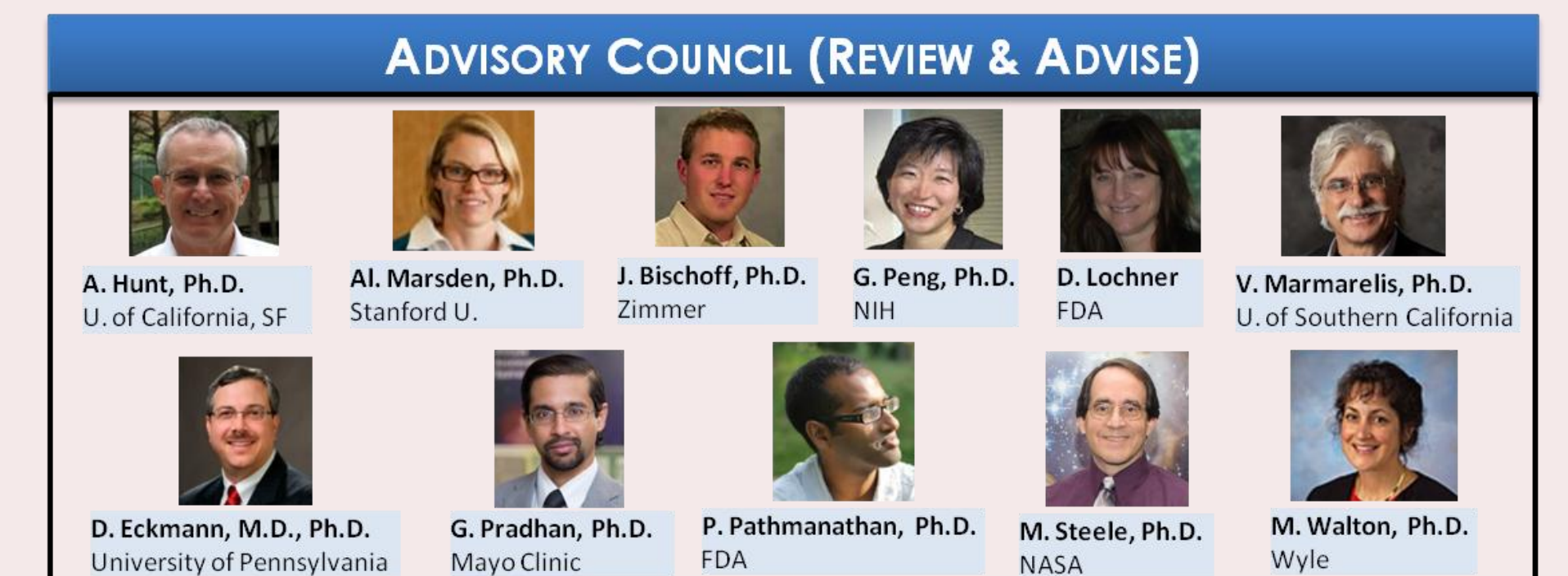
- Executive Committee (EC) executes mission
- Advisory Council provides guidance to EC



- Extensive use of crowd-sourcing of the healthcare and M&S community through surveys, wiki contributions and forum discussions

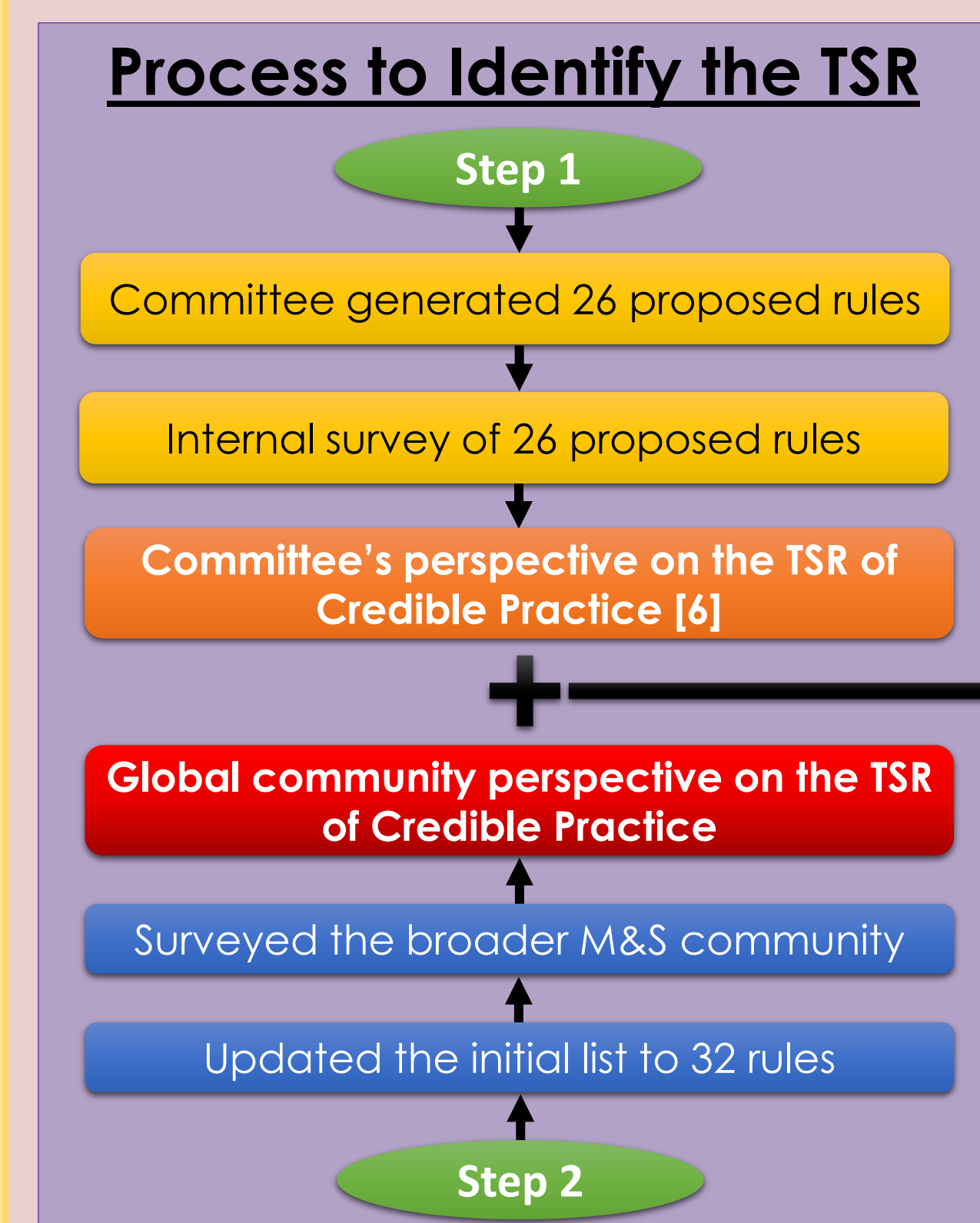


COMMUNICATION • ACCOUNTABILITY

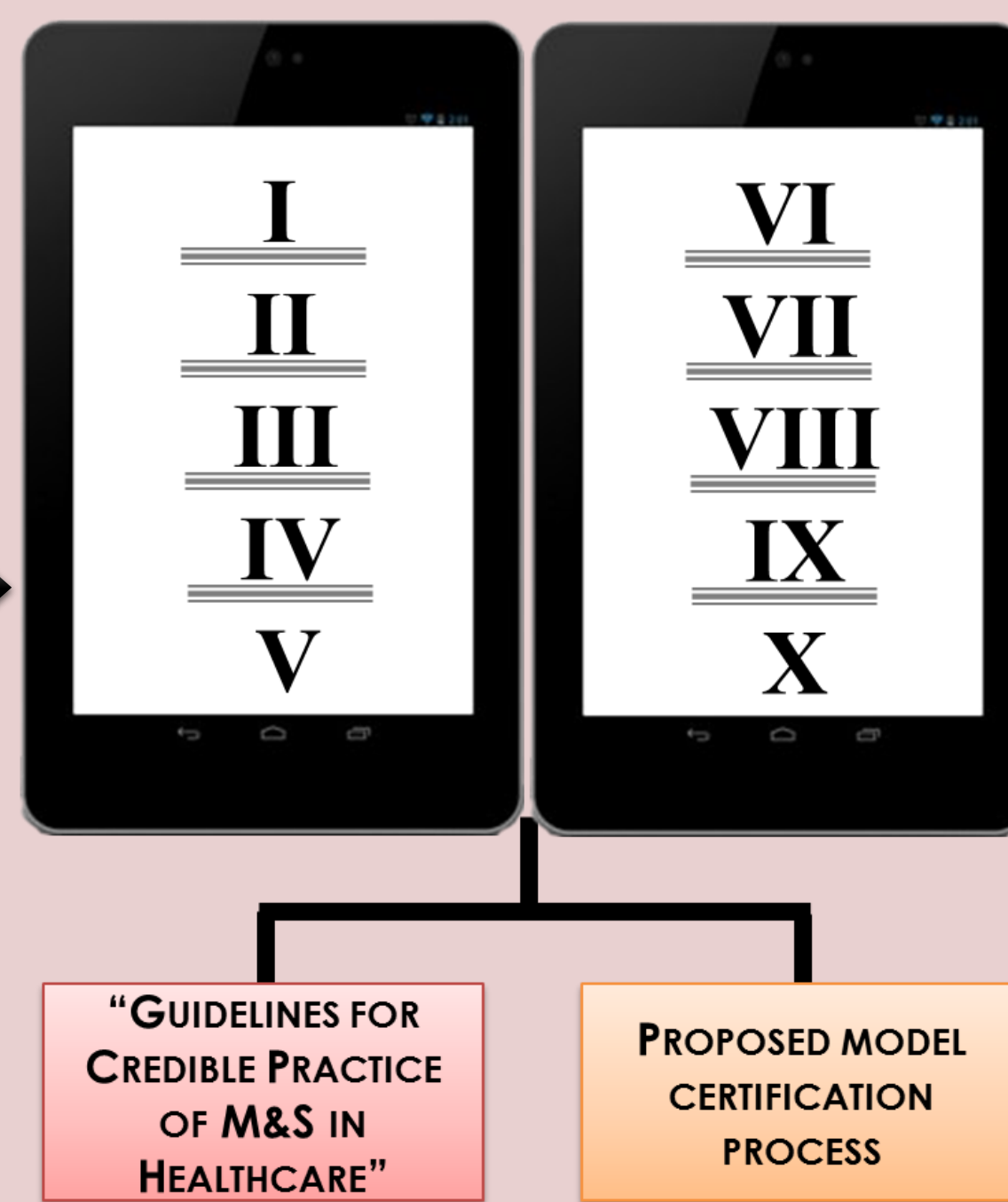


- Apply the Ten Simple Rules (TSR) of Credible Practice with appropriate intensity for given context of use

General Credibility Workflow



COMMUNITY GENERATED TEN SIMPLE RULES



Current status: Analysis of the global survey data and consolidation with the Committee's perspective results are still in progress. However, the following four high priority rules have been identified by both the Committee and broader M&S stakeholder community.

Simple Rule	Description
Define context clearly	Develop and document the subject, purpose, and intended use(s) of the model or simulation
Use appropriate data	Employ relevant and traceable information in the development or operation of a model or simulation.
Evaluate within context	Verification, validation, uncertainty quantification, and sensitivity analysis of the model or simulation are accomplished with respect to the reality of interest and intended use(s) of the model or simulation.
List limitations explicitly	Restrictions, constraints, or qualifications for or on the use of the model or simulation are available for consideration by the users or customers of a model or simulation.

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[3] J.A. Kopec et al., "Validation of population-based disease simulation models: a review of concepts and methods," BMC Public Health, Vol. 10, Issue 710, November 2010.
[4] D. Waltemath et al., "Reproducible computational biology experiments with SED-ML - The Simulation Experiment Description Markup Language," BMC Syst. Biol., Vol. 5, Issue 198, December 2011.
[5] Committee on Credible Practice of Modeling & Simulation in Healthcare - <http://wiki.simtk.org/cpms/>
[6] A. Erdemir, L. Mulugeta and W.W. Lytton, "Ten 'not so simple' rules of credible practice of modeling and simulation in healthcare: A multidisciplinary committee perspective", 2015 Frontiers in Medical Devices: Innovations in Modeling and Simulation, Washington, DC, 2015 [URL: <http://tinyurl.com/hwyvjtst>, Accessed April 24, 2016].