

USABILITY OF SEMI-SOLID EXTRUSION 3D PRINTING IN HOSPITAL PHARMACY SETTINGS TO PRODUCE PERSONALIZED ORAL MEDICATIONS FOR PEDIATRIC PATIENTS

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BACKGROUND AND IMPORTANCE

- A lack of licensed, age-appropriate pediatric medicines for oral use has traditionally been solved by extemporaneous manufacturing.
- Printing technologies may present a novel alternative to provide personalized and child-friendly doses and dosage forms¹.
- Despite the recent progress in the development of 3D printers for pharmaceutical applications, there is a lack of research on their usability in extemporaneous manufacturing in hospital pharmacy settings.

AIM AND OBJECTIVE

To study the perspectives of hospital pharmacy personnel on the usability of semi-solid extrusion printing.

MATERIALS AND METHODS

Study design:

Qualitative focus group discussions.

Participants:

- Voluntary pharmacists and pharmacy technicians (n=43) from one hospital pharmacy in Finland and one in Sweden.
- No previous experience in 3D printing of medicines.

Focus group discussions (n=9):

- Organized in May – September 2023.
- Demonstration in using a semi-solid extrusion printer (Curify MiniLab, CurifyLabs, Finland) prior to the discussions.
- Pilot of the discussion guide.
- Discussions audio-recorded and transcribed verbatim.

Data analysis:

- Qualitative content analysis to identify benefits and barriers.

RESULTS

Participants perceived the equipment as easy to use. Themes and sub-themes were identified:

- Benefits that favor the use of semi-solid extrusion printing in hospital pharmacies (Figure 1)
- Barriers that need to be considered before implementation (Figure 2).

Sub-themes of benefits and barriers included comments that concerned both production in hospital pharmacy and drug administration in hospital wards (Figure 3). Exposure to medicinal powder was believed to be reduced compared to the pharmaceutical preparation of dose powders and crushing of tablets in the wards. Suggestions for equipment specific development and process optimization were brought up in the conversations, such as, use of auxiliary tools, disposable cartridges and nozzles, and printing directly into blisters.

CONCLUSIONS

- To our knowledge, this is the first study to evaluate the perspectives of hospital pharmacy staff on the usability of semi-solid extrusion printing in drug manufacturing in a hospital environment.
- Our results show that, despite identified further development needs, the manufacturing process show great potential.

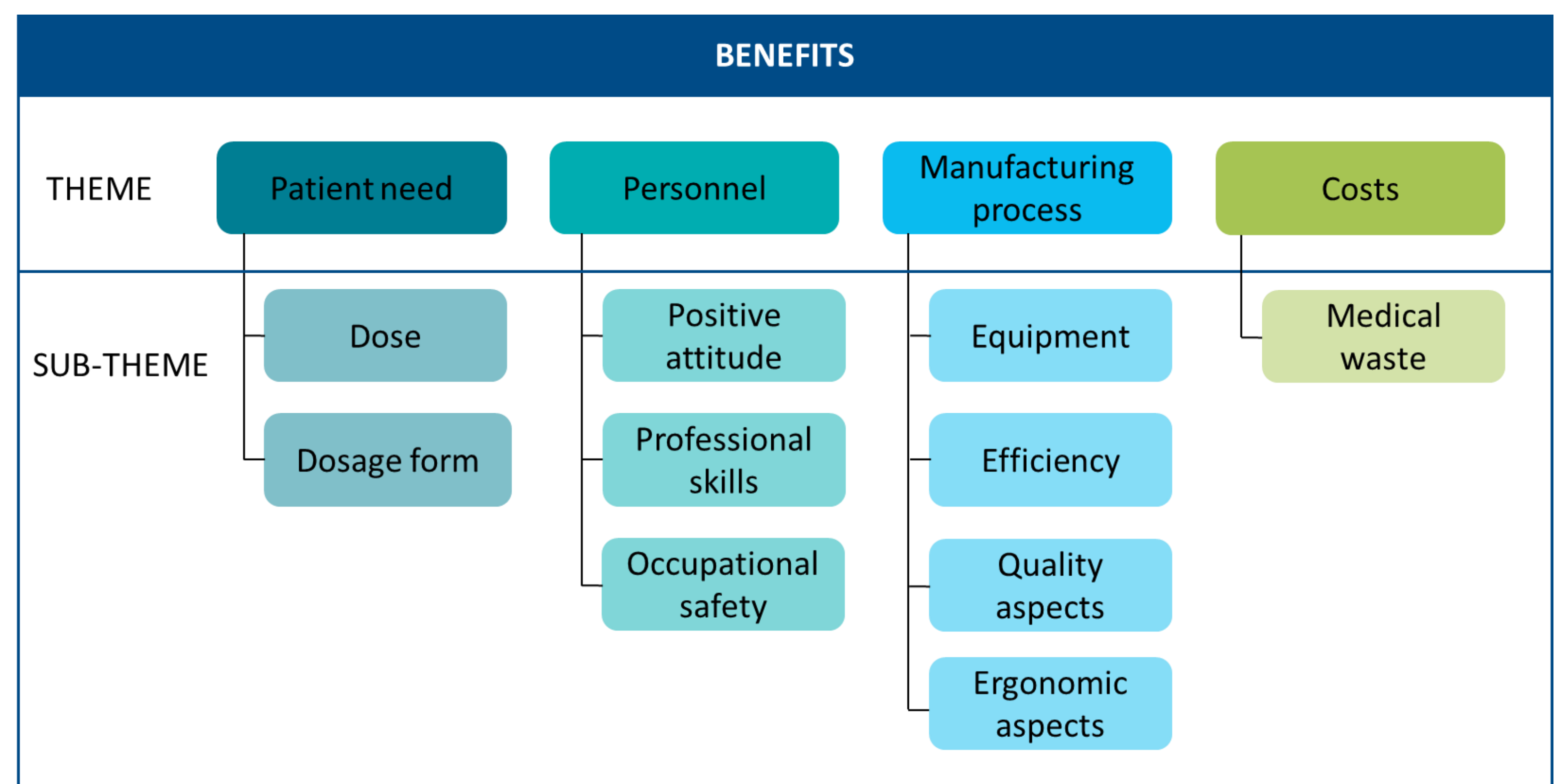


Figure 1. Themes and sub-themes that emerged from the qualitative content analysis regarding benefits that favor the use of semi-solid extrusion printing in hospital pharmacies.

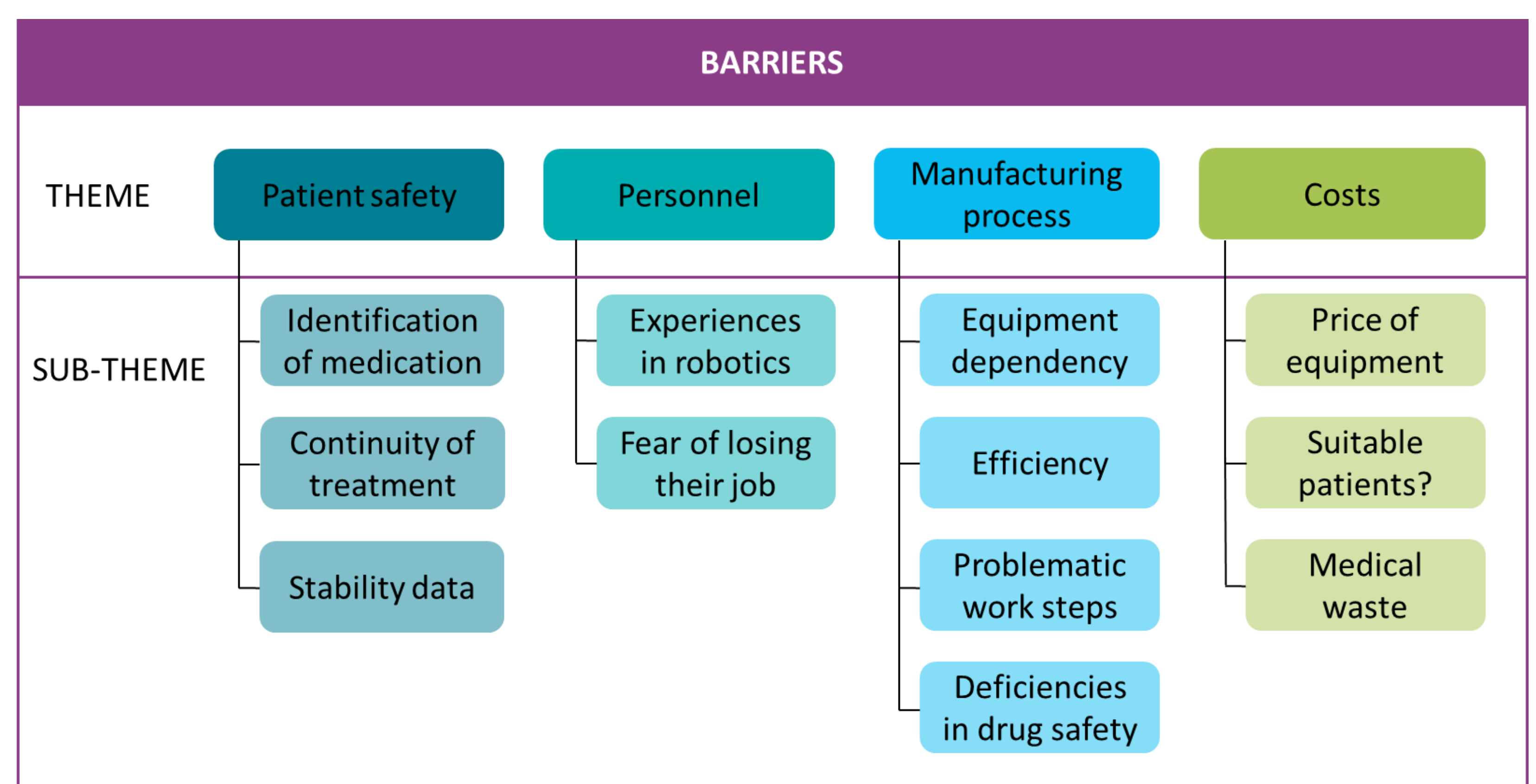


Figure 2. Themes and sub-themes that emerged from the qualitative content analysis regarding barriers that need to be considered before implementing semi-solid extrusion printing in hospital pharmacies.

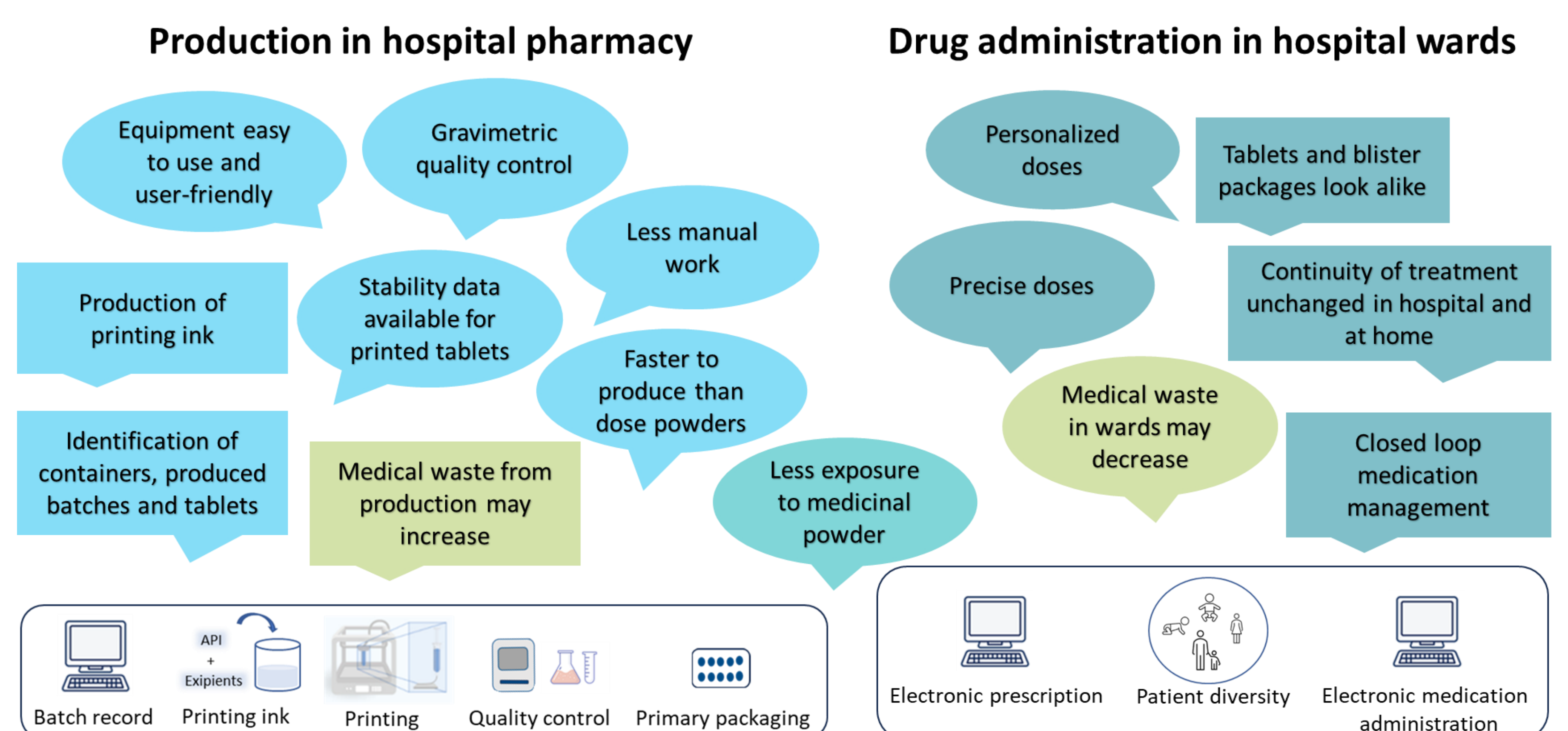


Figure 3. Examples of comments on benefits (round speech bubbles) and barriers (squared speech bubbles) of the identified sub-themes and themes, arranged according to process at hospital pharmacy or in hospital ward. The colors of the speech bubbles describe the themes and sub-themes presented in Figures 1 and 2.

References: 1. Rautamo M. Age-appropriate oral pediatric formulations in hospitals – evaluation of the suitability of printing technologies in meeting patient needs. Published in the Doctoral School of Health series Dissertationes Scholae Doctoralis Ad Sanitatem Investigandam Universitatis Helsinkiensis 54/2022.

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