Tables and smartphones are increasingly often being used to support workflows of healthcare professionals in clinical settings. Studies have shown that mobile devices can facilitate workflows by providing access to clinical information systems while supporting the mobility requirements of the users. The use of tablets is promising as they provide a reasonable screen size while remaining easily portable. Studies have primarily reported on the effects on workflow by using tablets in patient wards. There is an interest in the use of tablets in clinical microbiology, where they can potentially be used to facilitate workflows of advanced diagnostic tests to provide accurate and timely results.

This PhD thesis is part of a research project that aims to develop a rapid molecular diagnostic test called MuxBCT, which is used for the identification of microorganisms from positive blood cultures (BCs). The objective of this PhD thesis was to investigate how to design and evaluate a MuxBCT tablet app that aims to facilitate the MuxBCT diagnostic test.

Four studies were conducted as a part of this PhD thesis. The first study was an observational study of the workflow of medical laboratory scientists (MLSs) during BC analysis, which provided a set of requirements that the MuxBCT app needed to support. Based on the findings from the first study, a prototype of MuxBCT was designed. In study two, four usability experts and four MLSs evaluated the prototype in a participatory heuristic evaluation, which revealed domain-related usability issues. The results of study two guided the further design of the MuxBCT app and led to an optimization of the user interface and changed the app functionality.

In study three, the MuxBCT app design and system architecture was evaluated through a clinical simulation. Four MLSs used the MuxBCT app in a clinical microbiology laboratory to guide the use of a simulated MuxBCT test for identification of eight microorganisms from mocked BCs. The study findings indicated that the system design was feasible for supporting the MuxBCT test as all eight microorganisms were correctly identified. Study four was a non-interventional study, where the MuxBCT app was used together with a prototype of the MuxBCT test. Four MLSs analyzed positive BCs in a clinical microbiology laboratory in parallel with routine diagnostics. For 124 BCs, the MuxBCT results had an accuracy of 92.7% and were available near the time of preliminary routine test results. Additionally, the users reported that the app had successfully facilitated the use of the MuxBCT test.

In conclusion, this PhD thesis demonstrates that specialized tablet apps can be used to support the workflows of advanced diagnostic tests in clinical laboratories.
To fulfill the requirements for the Ph.D. degree, Lasse Lefevre Samson has submitted the thesis: “Design and Evaluation of a Tablet App for Supporting the Clinical Microbiology Diagnostic Test MuxBCT”, to the Faculty Council of Medicine at Aalborg University.

The Faculty Council has appointed the following adjudication committee to evaluate the thesis and the associated lecture:

Dr. Abdul Roudsari  
University of Victoria  
Canada

Dr. Ram Dessau  
Slagelse Hospital  
Denmark

Chairman:  
Dr. Lasse Riis Østergaard  
Medical Informatics Group, Aalborg University  
Denmark

Moderator:  
Dr. Johannes Struijk  
Medical Informatics Group, Aalborg University  
Denmark

The Ph.D. lecture is public and will take place on:  
Friday 10 June 2016 at 13:00  
Aalborg University – Fredrik Bajers Vej 7 C2-209  
9220 Aalborg East

Program for Ph.D. lecture  
by  
Lasse Lefevre Samson  
Friday 10 June 2016

Design and Evaluation of a Tablet App for Supporting the Clinical Microbiology Diagnostic Test MuxBCT

Chairman:  Dr. Lasse Riis Østergaard
Moderator:  Dr. Johannes Struijk

13.00  Opening by the Moderator
13.05  Ph.D. lecture by Lasse Lefevre Samson
13.50  Break
14.00  Questions and comments from the Committee
14.00  Questions and comments from the audience at the Moderator’s discretion
16.00  Conclusion of the session by the Moderator

After the session a reception will be arranged in C1-215 (MI meeting room)