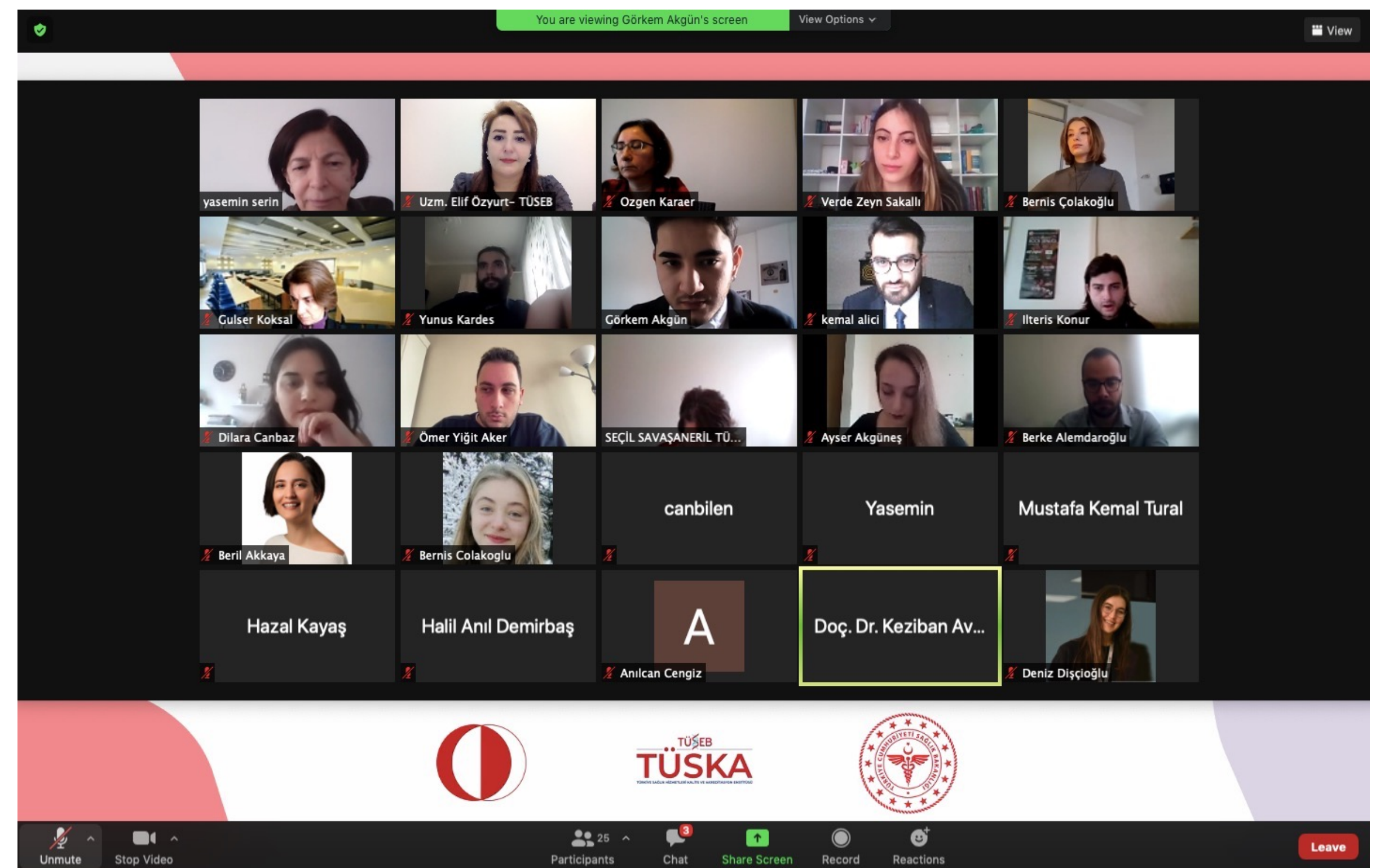


Objectives

Medical devices play a crucial role in the health and care services presented by the health personel in the hospital. It is important for the health of the patients and the continuation of the operation of the hospital that these medical devices are safe and functional. In this context, this study aimed to develop medical device's repair and regain process of a city hospital.



Methods

In order to detect signs of problems, we collected a set of data from a specific sample taken from the hospital, and by interpreting the data from different angles, we identified our problem symptoms as high failure rates in various types of medical devices, long spare parts/service procurement processes and long downtimes of medical devices. In the solution approach, the system of the simulation model is used to achieve a more realistic representation. The complexity of calculating the optimization is overcome by calculating the initial parameters of the simulation models in different models. Three different models were used as the solution approaches of the study: continuous review inventory model, queuing model and simulation model.

Different models were evaluated in terms of their strength and weakness representativeness of the model and computational efficiency. As initial solution approach queue model is offered, however, lately, the final solution approach is enriched by two other models due to increase both representativeness and computational efficiency. During selection of solution approach all models started to constructed and required parameters were computed. Then, all models were solved iteratively. Firstly, continuous review inventory model was solved, and its result was given to queue model as upper bound. Queue model was run with different combinations of decision variables and all feasible solutions were compared in terms of cost and performance measures. The decision variable combination with minimum cost and relatively high-performance measure values was selected for all device types. Queue model's solutions was benefited to feed simulation model with its results as starter point. To find a cost-effective suboptimal solution with high efficacy with simulation model a heuristic was constructed. Verification and validation of all models were done during solution procedure. After applying heuristic, a pareto chart were obtained to recommend to the hospital. With this pareto chart, they can select one of the four suboptimal solutions according to their needs and trade of between availability of devices and costs.

Results

Especially, when cost is primary concern, for exaple NST Probe recommended spare part inventory policy is continuous review policy with $R = 2$ and $Q = 13$, and for USG $R = 0$ and $Q = 5$. When availability is the primary concern, for NST Probe recommended spare part inventory policy is continuous review policy with $R = 2$ and $Q = 13$, and for USG $R = 5$ and $Q = 5$. In additions it is possible to choose two other solutions. These policies decrease cost up to 30% compared to current situation, increases availability nearly 2% and improves time in system for NST up to 56% and for USG up to 80%.

Conclusion

The conclusion of the study is that no matter which solution is chosen by the institution in the pareto chart, keeping an inventory of spare parts reduces costs and improves performance measurement. Developing an implementation plan should be planned for future research in order to work on improving the repair process by keeping a real-life spare part inventory.

