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EVALUATING THE IMPACT OF MACHINE LEARNING ON THE TIME NEEDED BY STUDY NURSES TO IDENTIFY POSTOPERATIVE COMPLICATIONS

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INTRODUCTION

To maintain the quality of surgical care, it seems essential to measure and compare the quality of health care delivery in various institutions. The monitoring of postoperative complications after surgical interventions is of particular importance here.

However, most expensive is the cataloging of risk factors and complications from Electronic Health Records (EHRs) by study nurses. This process is time consuming and costly.

We developed a model to identify surgical patients with one or more postoperative complications using structured patients' EHR data and machine learning (ML) that correctly classified 76% of patients with a postoperative complication.

AIM

The aim of this study was to investigate, whether by using ML models to predict complications with a high probability beforehand, the cataloging of complications might be facilitated, and the time required for study nurses to analyze a case be reduced.

METHOD

In a randomized, controlled study, the influence of individual complication predictions per patient before the start of the analysis on the respective time investment of our study nurses was examined.

A total of 1390 patients included in our study from January to June 2022 were randomly assigned to either the intervention (n=682) or the control group (n=708). A prediction was generated for each patient in the intervention group as to whether the patient had one or more complications. A list of predictions (complicative case yes/no) was provided for each study nurse at the beginning of every month. The study nurses measured the time needed for analyzing each case using a stopwatch in both groups.

Potential risk factors (type of operation performed, study nurse, ASA classification, complication y/n and number of complications) for the time needed to review a case were analyzed using regression analysis in a subgroup of patients without complications.

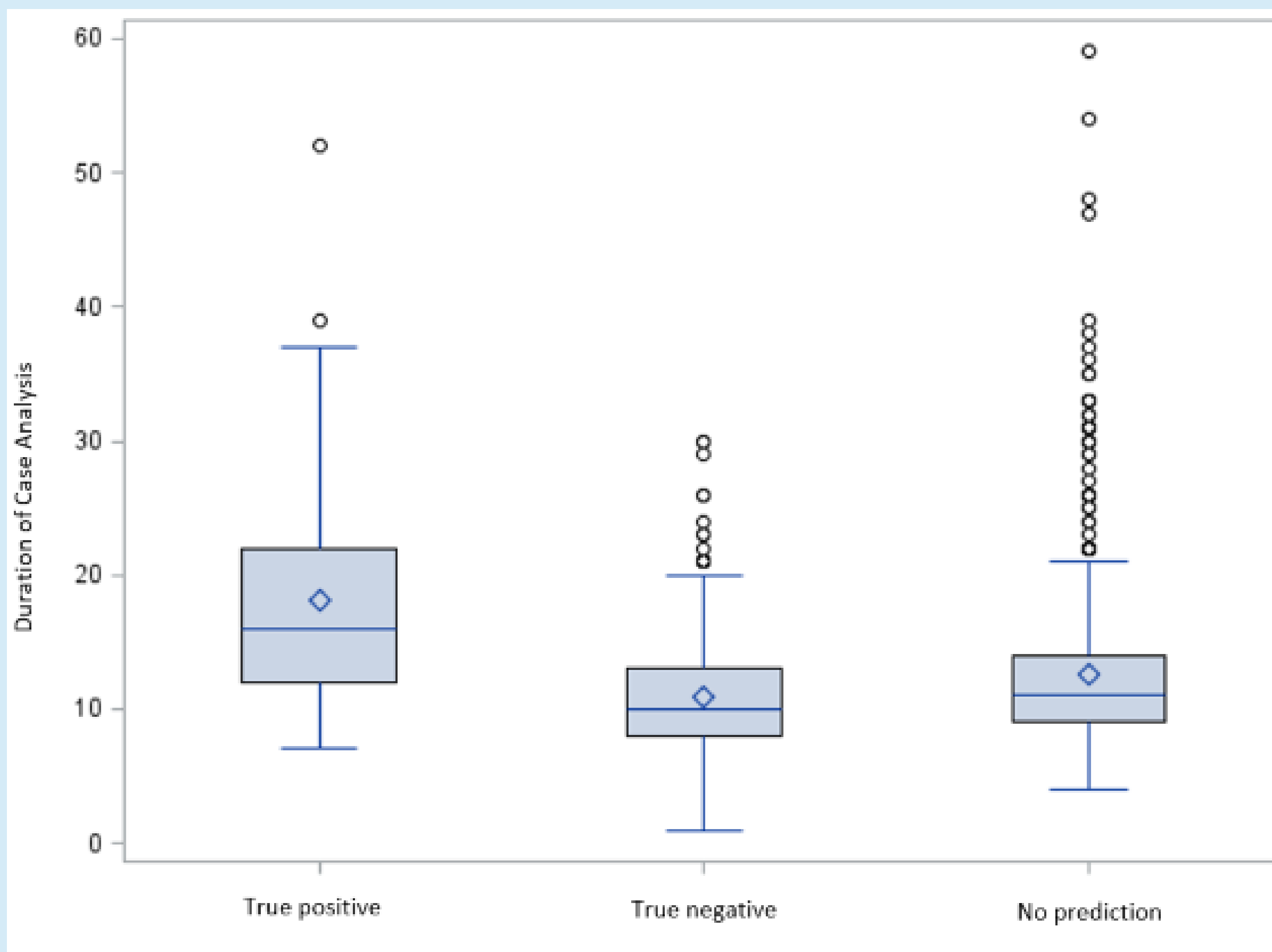
RESULTS

The mean time (min - max) needed for the analyses of a case in the intervention group was 15.54 minutes (1.00-117.00) vs. 15.69 minutes (4.00-97.00) for the control group (NS).

In a subgroup of patients without complications (n= 1092) the mean time (min - max) needed for the analyses of a case in the intervention group was 12.27 minutes (1.00-52.00) vs. 12.60 minutes (4.00-59.00) for the control group (NS).

In the patients of the intervention group without complicative cases that were predicted rightly to be not complicative (= true negative; n= 424) 10.85 minutes (1.00-30.00) was needed for analyses (p<0.001) vs. patients with an incorrect forecast (= false positive; n= 105) 18.05 minutes (7.00-52.00) were needed for analyses (p<0.001).

Hernia repair (-2.74; p<0.001), colon surgery (6.92; p<0.001), rectum surgery (15.32; p<0.001) and prostatectomy (2.09; p<0.001) vs. thyroidectomy, study nurse 1 (-1.91; p<0.001), prediction of complication false positive (1.82; p<0.001) and true negative (-0.89; p<0.001) vs. control group were significantly associated with the time needed to review a case.



CONCLUSIONS

No significant difference concerning the time needed to analyze a case with or without the support through ML models could be demonstrated.

A further analysis of the data revealed that patients without complications who were correctly predicted to not have complications had a significantly shorter review time than patients who were incorrectly predicted to have complications (p<0.001).

ACKNOWLEDGEMENT

As 24% of patients were not predicted correctly by our models, it may be speculated that with a more accurate prediction of complicated cases, the time needed for reviewing might be reduced.

REFERENCES

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