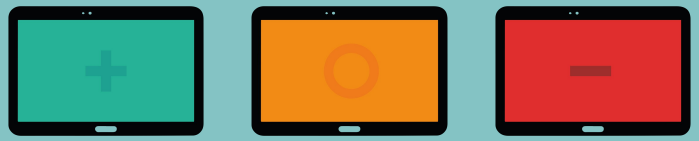
AI for decision support in perioperative and critical care

AI in Care Process Optimization

Leiden Drug Development Conference 2024



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Disclosures

Employee at Healthplus.ai.

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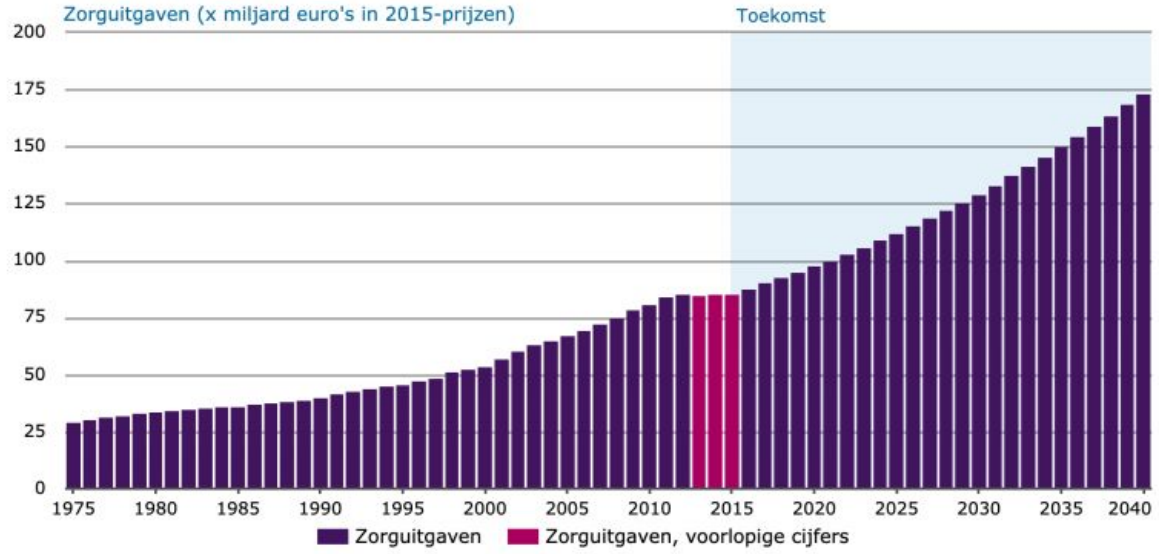
A 2021 report released by the American Association of Medical Colleges projects shortages of 15,800-30,200 in all surgical specialties by 2034.

The American College of Surgeons
https://www.facs.org › advocacy › federal-legislation
Surgical Workforce | ACS - The Ameri

Centers for Disease Control and Prevention | CDC (.gov)
https://www.cdc.gov › vitalsigns › health-worker-menta...
Health Workers Face a Mental Health Crisis | VitalSigns

s reported feeling burned out often or
percentage of ...



Source: CBS

How can AI contribute to solving these healthcare challenges?

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AI has the potential to assist in every aspect of the patient journey

Preoperative screening	Surgery	Recovery at the intensive care unit (ICU)	Discharge and follow-up
• AI-based decision support giving personalized advices and risk of complications • Predicting no-shows and optimize surgical planning	• Assist anaesthesiologist in giving optimal anesthesia • Surgical treatment planning	• AI-based decision support predicting risk of complications and deterioration and provide guided treatment decisions • Smart alarming systems to prevent alarm-fatigue	• Determine appropriate moment of discharge • Support in administrative workload • Home monitoring

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AI-based decision support predicting the risk of postoperative infections

1. Introduction to postoperative infections and the development of PERISCOPE
2. Decision support to optimize surgical care
3. Challenges and pitfalls

AI-based decision support predicting the risk of postoperative infections

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Postoperative infections

Postoperative infections

10-15% of 324M surgery patients get an infection.

Huge additional cost

Adding €10,000 cost per patient or **€~35M per hospital per year**, and doubling stay & recovery time

Data overload

Data overload due to large number of results & notes, and the large number of patients leads to **late diagnosis - day 5+** on average

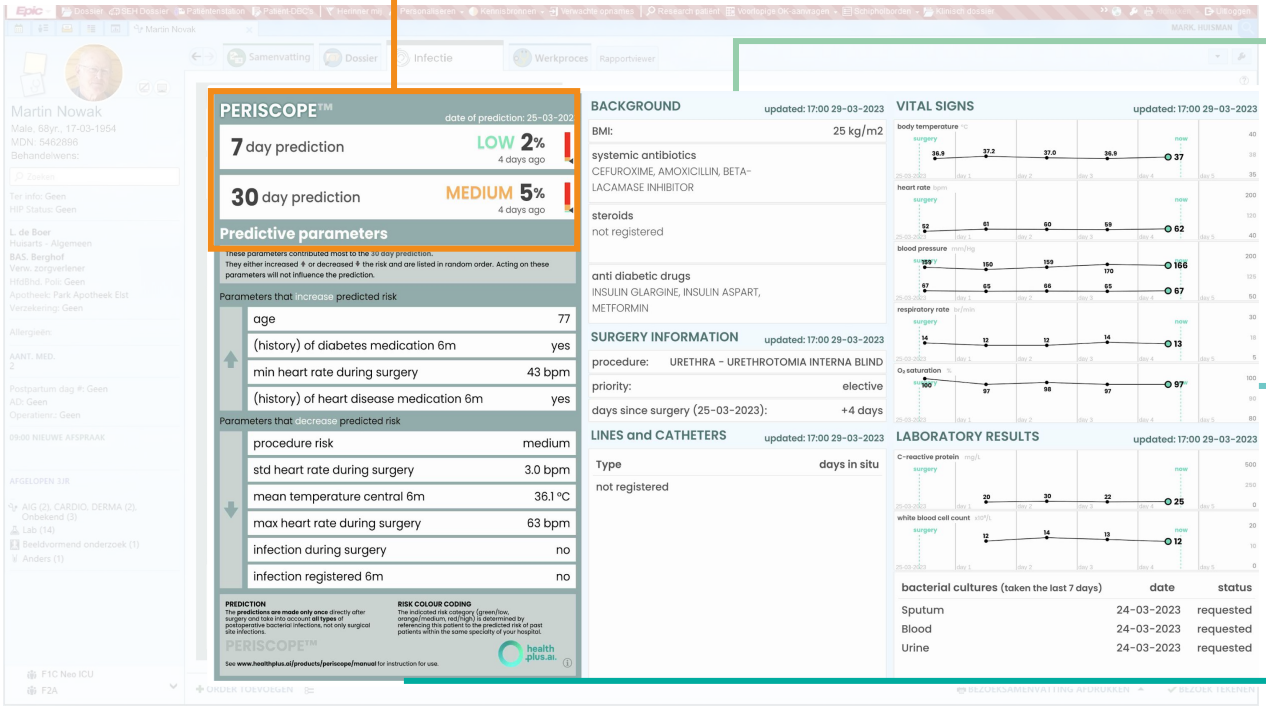
AI-based decision support system developed by Healthplus.ai in close collaboration with the Leiden University Medical Center

Predicts all infections with high accuracy (AUC > 0.80)

Integrated in the Electronic Health Record

From 10 clicks to 1 click

AI in perioperative care: PERISCOPE for predicting postoperative infections



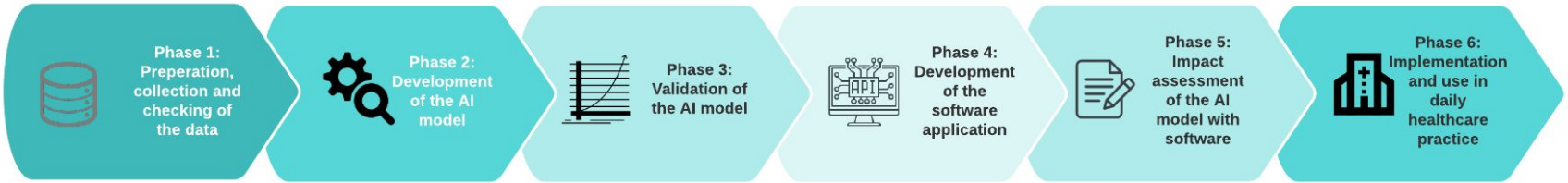
Predictions
Single 7 & 30-day & traffic light

Background
Relevant surgery and patient data

Trend display
Continuously updated relevant laboratory and vital signs information

Explainability
Parameters that increase and decrease the likelihood of an infection

Model development and validation steps



Electronic health record data needs to be of sufficient quality and sample size

The model is trained to predict the outcome of interest (e.g., postoperative infections)

Thorough temporal and geographical validations need to be performed

Ideally, the software application is integrated in the electronic health record

Assessing real life impact on patient outcomes and costs

Ensuring efficient implementation in the daily workflow

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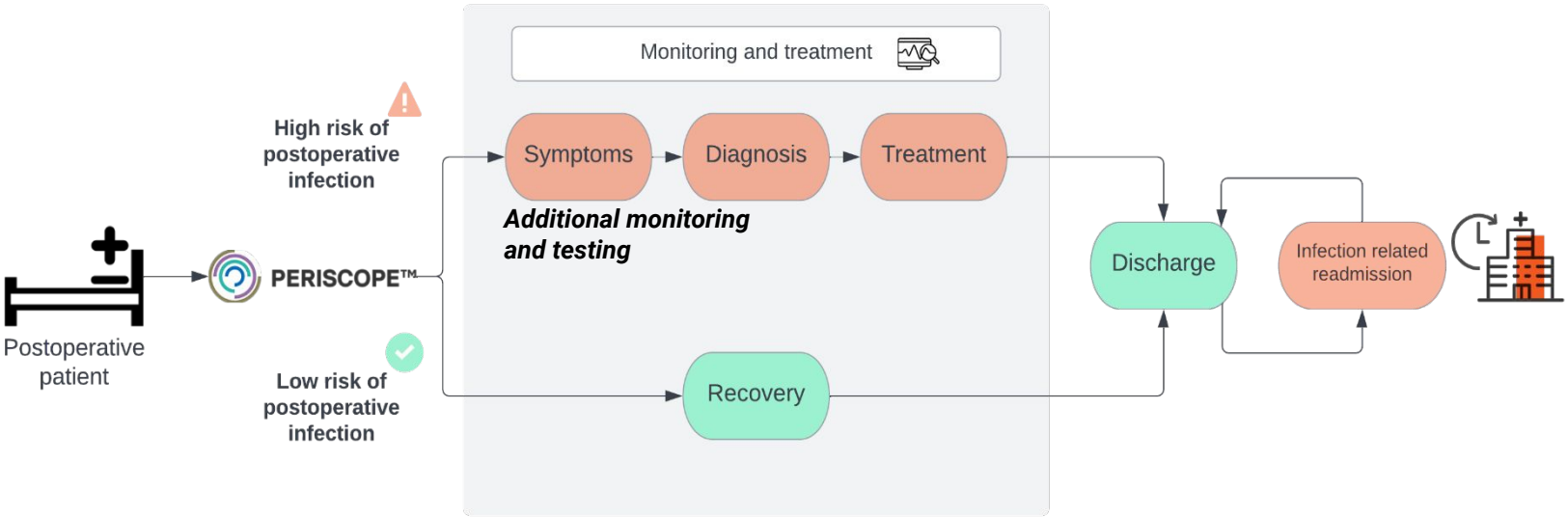
Decision support reducing readmissions and length of stay



Surgical care optimization

Patient

Shorter stay & faster recovery
Less (impact of) infections
Sustained Quality of Life

Clinicians

Less admin time
More time for the right patient

Hospitals

Reduced cost
Reduced waiting lists

To be evaluated in clinical practice!

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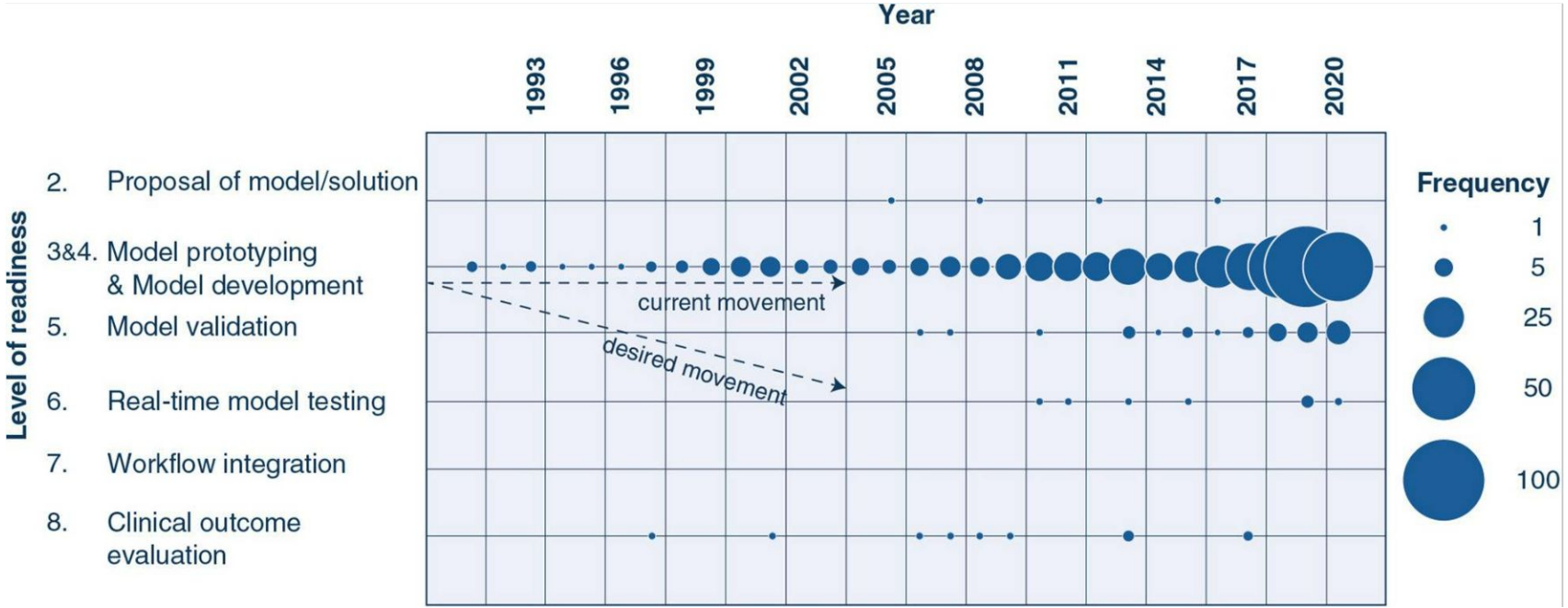
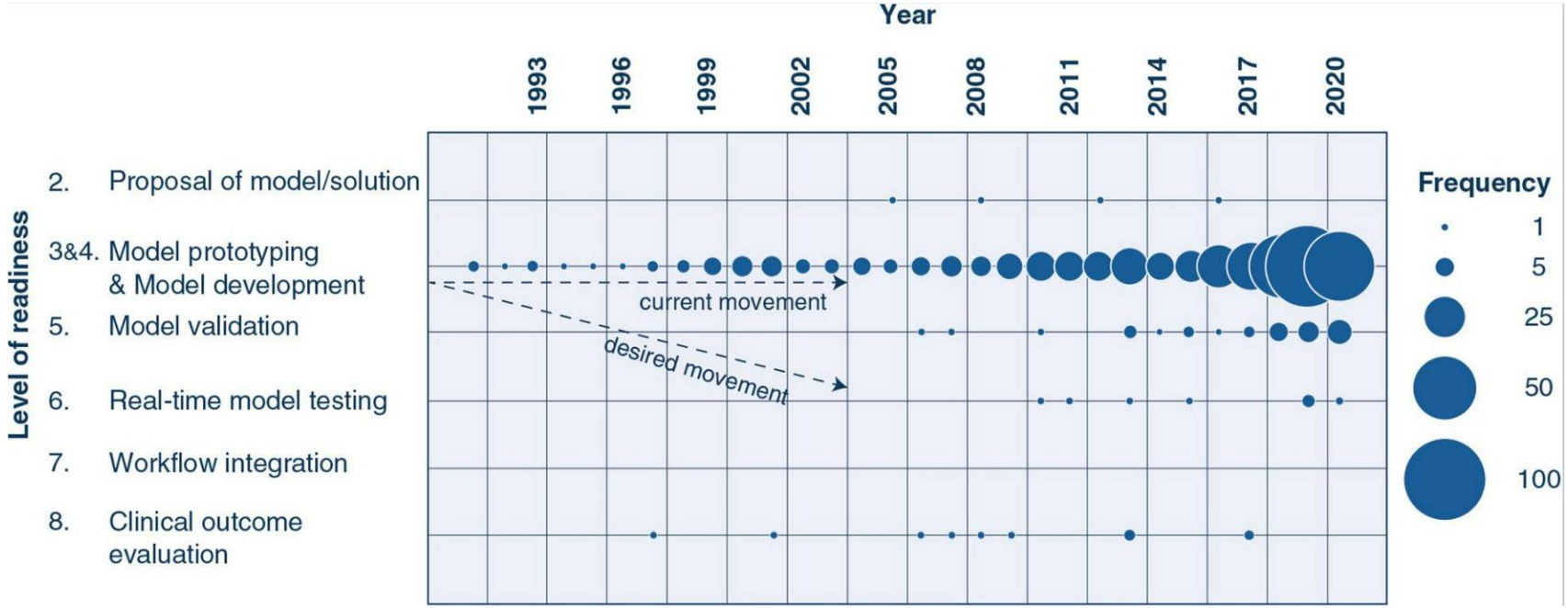
Challenges: Gap towards implementation



van de Sande et al. Intensive Care Med. 2021

Challenges: Gap towards implementation



Barriers on several domains: data availability and completeness, ethics, technology and infrastructure, regulations, liability, patient safety

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Challenges: External validity and generalizability

June 21, 2021

External Validation of a Widely Implemented Proprietary Sepsis Prediction Model in Hospitalized Patients

Andrew Wong, MD[1]; Erkin Otles, MEng[2,3]; John P. Donnelly, PhD[4]; et al

» Author Affiliations | Article Information

JAMA Intern Med. 2021;181(8):1065-1070. doi:10.1001/jamainternmed.2021.2626

The study examined data from nearly 40,000 hospitalizations at Michigan Medicine in 2018 and 2019. Patients developed sepsis in 2,552 of those hospitalizations. Epic's sepsis tool missed 1,709 of those cases, around two-thirds of which were still identified and treated quickly. It only identified 7 percent of sepsis cases that were missed by a physician. The analysis also found a high rate of false positives: when an alert went off for a patient, there was only a 12 percent chance that the patient actually would develop sepsis.

theverge.com

Challenges: External validity and generalizability

Due to differences in electronic health record data formatting, patient populations, local ways of working and protocols reflected in the data etc.

→ Need for **local validations, recalibrations and/or retraining** before deployment in clinical settings!

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→ Need to access large clinical datasets

→ Local model maintenance and monitoring

…

Takeaways

Potential of AI to **impact major healthcare challenges** in perioperative, critical care and beyond

PERISCOPE is developed to enhance postoperative decision making

Challenges related to **implementation** and model **generalizability** make the number of deployed AI tools scarce

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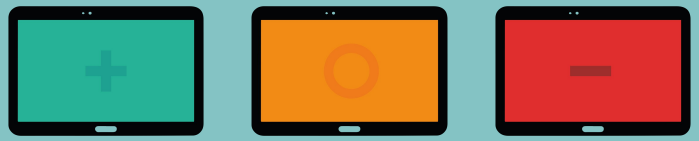

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