Patient safety in oncology: quantifying the hospital-associated risks with a discrete-event simulation

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BACKGROUND

The WHO reports that the occurrence of adverse safety events due to unsafe care is likely to be one of the 10 leading causes of death and disability in the world, and that approximately 50% of patient safety events are considered preventable[1]. There are safety risks at every stage of the oncology pathway and it is critical to identify them in order to act and improve patient outcomes.

OBJECTIVES

This research aimed at quantifying the patient safety risks in a hospital setting considering 2 potential oncology scenarios:
1: day-case patients getting antineoplastic preparations as part of their intravenous (IV) chemotherapy.
2: hospitalized patients undergoing surgery.

METHODS

The patient pathways of the scenarios were mapped according to the UK setting, and their applicability was tested through experts interviews in the EMEA region. The baseline risks associated with each step of the two patient journeys were quantified through desk literature research, including the additional length of stay associated with each potential adverse event. A discrete event simulation was developed to recreate the hospital environment and quantify the overall risks along the patient journeys if no preventive actions were put in place.

RESULTS

The patient journeys were validated in different EMEA hospitals and the following type of risks that could impact the patients, if not prevented, were identified: pre-treatment diagnostic errors leading to delay or incorrect treatment; medication management errors (including dispensing, preparation, and administration) and hospital acquired infections (including catheter-related bloodstream infections; surgical and urinary infections for the surgical pathway only). The simulation quantified that in Scenario 1, every 1'000 patients getting day-case IV chemotherapy, there is a risk of 22 possible complications: 11 in the diagnostic phase and 11 in the medication management process. In Scenario 2, 147 complications can occur, every 1'000 patients undergoing surgery, including 45 surgical site infections and 10 urinary tract infections, leading to more than 3'800 extra bed days in the wards and 396 extra bed days in the intensive care unit.

CONCLUSION

An oncology patient entering a hospital is facing many hazards that can put safety at risk and increase pressure on hospital capacity. The adoption of best practices and effective technologies to prevent such risks should be incentivized by hospital decision makers.

WHAT'S NEW

1. Discrete event simulations used to quantify the risks associated with in-hospital oncology patients treatment during their stay
2. Possibility to extend a similar approach to other areas of disease

Figure 1: Patient pathways

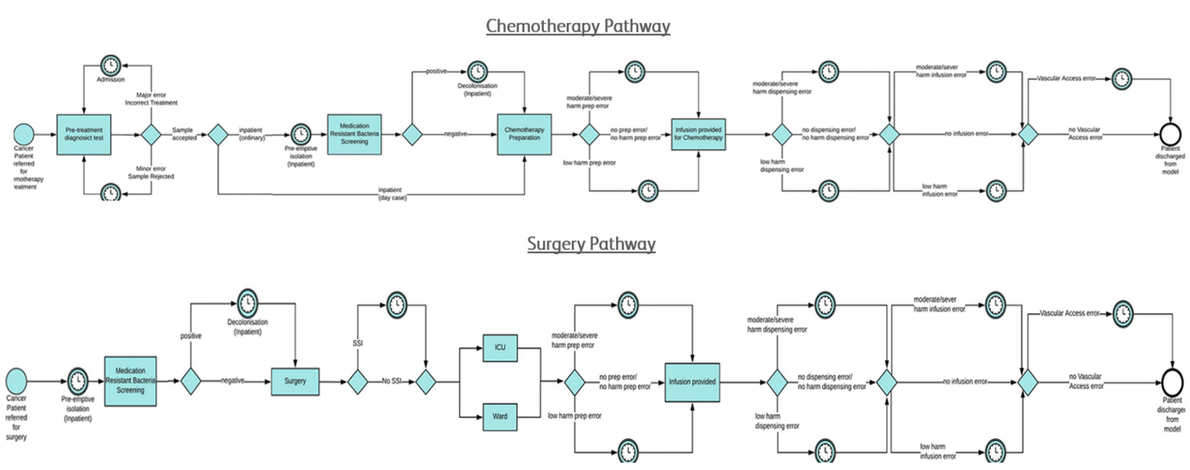

Figure 2: Schematic representation of the model

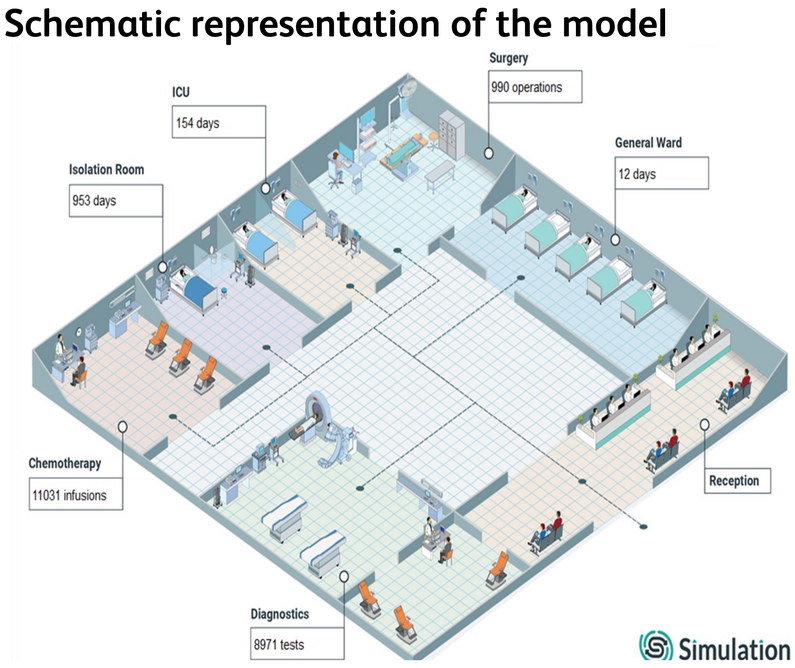

Table 1: Model's parameters

Parameter	Model's input
Risk of diagnostic errors per sample	1.67%[2]
Risk of IV chemotherapy preparation errors (>10% deviation)	2.25%[3]
Risk of drug infusion administration errors	0.54%[4]
Risk of surgical site infection	4.67%[5]
Risk of urinary tract infection	2.1%[6]
Additional lenght of stay: surgical site infection	8 days[7]
Additional lenght of stay: healthcare-associated urinary tract infection	4 days[8]

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