

SARS-CoV-2 vaccination modelling for safe surgery to save lives: data from an international prospective cohort study

COVIDSurg Collaborative, GlobalSurg Collaborative*

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Abstract

Background: Preoperative SARS-CoV-2 vaccination could support safer elective surgery. Vaccine numbers are limited so this study aimed to inform their prioritization by modelling.

Methods: The primary outcome was the number needed to vaccinate (NNV) to prevent one COVID-19-related death in 1 year. NNVs were based on postoperative SARS-CoV-2 rates and mortality in an international cohort study (surgical patients), and community SARS-CoV-2 incidence and case fatality data (general population). NNV estimates were stratified by age (18–49, 50–69, 70 or more years) and type of surgery. Best- and worst-case scenarios were used to describe uncertainty.

Results: NNVs were more favourable in surgical patients than the general population. The most favourable NNVs were in patients aged 70 years or more needing cancer surgery (351; best case 196, worst case 816) or non-cancer surgery (733; best case 407, worst case 1664). Both exceeded the NNV in the general population (1840; best case 1196, worst case 3066). NNVs for surgical patients remained favourable at a range of SARS-CoV-2 incidence rates in sensitivity analysis modelling. Globally, prioritizing preoperative vaccination of patients needing elective surgery ahead of the general population could prevent an additional 58 687 (best case 115 007, worst case 20 177) COVID-19-related deaths in 1 year.

Conclusion: As global roll out of SARS-CoV-2 vaccination proceeds, patients needing elective surgery should be prioritized ahead of the general population.

Introduction

The SARS-CoV-2 pandemic has disrupted elective surgery globally, with millions of elective operations either postponed or cancelled^{1–3}. Restriction of elective surgery activity was necessary during periods of high COVID-19 hospital admissions in order to divert hospital resources to ICUs^{4–6}. However, in many countries, owing to safety concerns, reductions in COVID-19 admissions have been associated with only limited recovery of surgical services¹. Even in areas with low community SARS-CoV-2 infection rates, surgical patients are at risk of nosocomial SARS-CoV-2 infection⁷, which is associated with high rates of postoperative pulmonary complications and death^{8,9}. Although mitigation measures, such as preoperative reverse transcription (RT)-PCR swab screening and COVID-free surgical pathways, can reduce the risk of COVID-19 complications^{7,10}, they are unlikely to be implemented universally, particularly in low- and middle-income countries (LMICs).

Several SARS-CoV-2 vaccines have been authorized internationally following phase III trials that demonstrated 100 per cent effectiveness in preventing COVID-19-related deaths^{11–14}. Preoperative

vaccination could support safe reinitiation of elective surgery by significantly reducing the risk of COVID-19 complications in patients undergoing elective procedures. However, it is projected that the population in only 37 countries will have widespread access to vaccination in 2021, with most LMICs only achieving widespread coverage from late 2022 onwards^{15,16}. Consequently, throughout 2021, most governments will prioritize access to vaccination to patients at greatest risk of COVID-19 mortality.

The benefits of SARS-CoV-2 vaccination in surgical patients are currently unknown, and therefore governments are not prioritizing them for vaccination. The aim of this study was to inform vaccination prioritization by modelling the impact of vaccination on mortality in patients undergoing any type of inpatient elective surgery.

Methods

This study explored the impact of SARS-CoV-2 vaccination in adult patients (age at least 18 years) undergoing any type of elective inpatient surgery. The primary outcome was number needed

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