high income countries and may not be necessary in low- and middle-income countries.

**METHODS:** We created simulated datasets to determine the sampling frame needed to reach a given precision. We validated our findings using data collected at Mulago National Referral Hospital in Kampala, Uganda. We used these data to create a tool that can be used to determine the optimal sampling frame for a population based on POMR rate and target POMR improvement goal.

**RESULTS:** Precision improved as the sampling frame increased. However, as POMR increased, lower sampling percentages were needed to achieve a given precision. A total of 3,578 eligible cases were identified in the Mulago database, with an overall POMR rate of 14%. Precision of ±10% was achieved with 34% sampling, and precision of ±25% was obtained at 9% sampling. Using simulated datasets, a tool was created to determine the minimum sample percentage needed to detect a given mortality improvement goal.

**CONCLUSION:** Reliably tracking POMR does not require continuous data collection. Data driven sampling strategies can be used to decrease the burden of data collection to track POMR in resource-constrained settings.

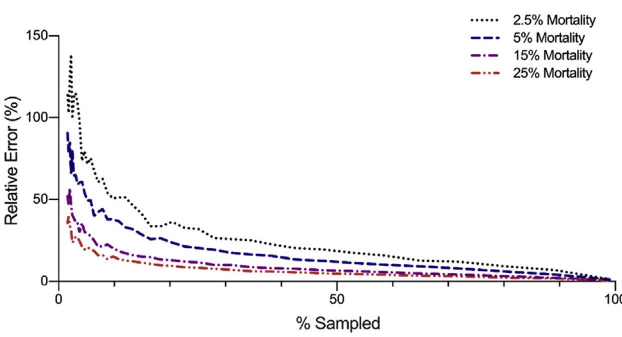



**Figure 1.** Precision of POMR estimates for 100 simulated studies, at 40 different sample sizes for multiple simulated datasets with differing POMRs.

## Non-Ground Level Fall-Related Injuries and Seasonality in Malawi

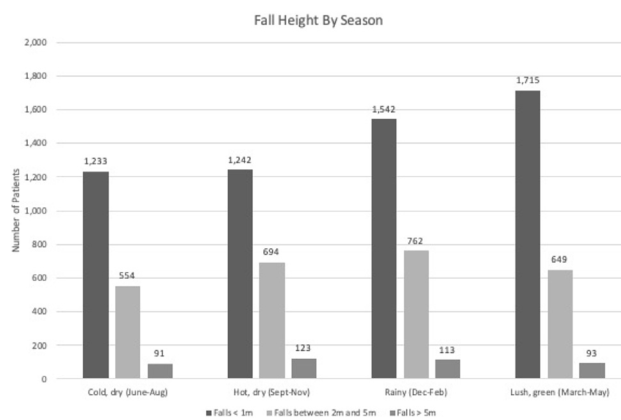
*Selena J An, MD, MSPH, MA, Linda Kayange, MBBS, Laura N Purcell, MD, MPH, Jared R Gallaher, MD, MPH, Anthony G Charles, MD, MPH*
University of North Carolina, Chapel Hill, NC
Kamuzu Central Hospital, Lilongwe, Malawi

**INTRODUCTION:** Fall-related injuries (FRI) are a leading cause of injuries worldwide. In resource-limited settings, data on injury patterns and seasonal variations of fall-related injuries are lacking. We hypothesize an increased incidence of non-ground level falls (NGLF) in the rainy season.

**METHODS:** We performed a retrospective analysis of FRI at Kamuzu Central Hospital in Malawi from 2008-2018. Demographic and injury characteristics, including fall height and mortality outcomes, were collected. Seasons were defined as cold dry (June-August), hot dry (September-November), rainy (December-February), and lush (March-May). We used Poisson multivariate regression to determine the effect of seasonality on injury incidence and mortality.

**RESULTS:** There were 8,792 patients who met inclusion criteria. Most NGLF were $< 1$ meter in height (65.1%), occurring most frequently during the lush season (27.9%, $p<0.01$). The second most common fall height was between 2-5 meters, occurring most often during the rainy season (28.7%). Students comprised the largest group of patients presenting with NGLF (43.3%). The most common injuries were contusions (40.6%) and fractures (35.2%), which were more likely to occur in the rainy season in comparison to the cold season (relative risk [RR]=1.08, $p=0.02$). Head and internal organ injuries were more likely to occur in the hot season (RR=1.59, $p<0.01$ and RR=1.64, $p=0.03$, respectively). Overall mortality was 0.53% without seasonal variation ($p=0.54$). After controlling for demographic variables and season, head (RR=31.2, $p<0.01$) and internal organ injuries (RR=11.1, $p<0.01$) were associated with mortality.

**CONCLUSION:** This study provides information about the seasonal variation in NGLF-related injuries, which is critical in determining resource allocation for prevention and treatment.




**Figure**

## Proposed Delay for Safe Surgery after COVID-19

*Joshua G Kovoor, BHlthMedSc (Hons), David A Scott, PhD, FANZCA, Vanessa S Beavis, MBBS, FANZCA, Jen Kok, PhD, FRCPA, Andrew D MacCormick, PhD, FRACS, Robert T Padbury, PhD, FRACS, Thomas J Hugh, MD, FRACS, Peter J Hewett, MBBS, FRACS, Trevor G Collinson, MS, FRACS, Mark Frydenberg, MBBS, FRACS*
University of Adelaide, Adelaide, Australia
Department of Anaesthesia and Acute Pain Medicine, St. Vincent's Hospital, Melbourne, Australia
Anaesthesia and Operating Rooms, Auckland City Hospital, Auckland, New Zealand
Centre for Infectious Diseases and Microbiology Laboratory Services, NSW Health Pathology

Institute of Clinical Pathology and Medical Research, Westmead Hospital, Sydney, Australia
Department of Surgery, South Auckland Clinical School, University of Auckland, Auckland, New Zealand
Flinders University, Adelaide, Australia
Northern Clinical School, University of Sydney, Sydney, Australia
University of Adelaide, Discipline of Surgery, The Queen Elizabeth Hospital, Adelaide, Australia
General Surgeons Australia, Adelaide, Australia
Department of Urology, Cabrini Institute, Cabrini Health, Melbourne, Australia

**INTRODUCTION:** Long-term effects after COVID-19 may affect surgical safety. This study aimed to evaluate the literature and produce evidence-based guidance regarding the period of delay necessary for adequate recovery of patients following COVID-19 infection before undergoing surgery.

**METHODS:** A rapid review was combined with advice from a working group of 10 clinical experts across Australia and New Zealand. MEDLINE, medRxiv, and grey literature were searched to October 4, 2020. The level of evidence was stratified according to the National Health and Medical Research Council evidence hierarchy.

**RESULTS:** A total of 1,020 records were identified, from which 20 studies (12 peer-reviewed) were included. None were randomized trials. The studies comprised 1 case-control study (level III-2 evidence), 1 prospective cohort study (level III-2), and 18 case-series studies (level IV). Follow-up periods containing observable clinical characteristics ranged from 3-16 weeks. New or excessive fatigue and breathlessness were the most frequently reported symptoms. SARS-CoV-2 may impact the immune system for multiple months after laboratory confirmation of infection. For patients with past COVID-19 undergoing elective curative surgery for cancer, risks of pulmonary complications and mortality may be lowest at 4 weeks or later after a positive swab.

**Table.** Recommendations from the working group on delaying surgery for patients recovering from COVID-19

| |
|---|
| Ensure COVID-19 swab negative. |
| Ensure adequate informed consent; if memory issues may need family present. |
| Assess degree of cardiac, respiratory, immunological and clotting abnormalities during the acute illness. |
| If minor surgery, 4-week waiting period may be adequate. |
| If major surgery, recommend waiting 8—12 weeks if possible. If severe illness at time of acute infection or ongoing long COVID-19 symptoms suggest physician review; preoperative review may include stress echocardiography, respiratory function tests, immune and clotting status review; potential high dependency or critical care in immediate postoperative period. |

**CONCLUSION:** After laboratory confirmation of SARS-CoV-2 infection, minor surgery should be delayed for at least 4 weeks and major surgery for 8 to 12 weeks, if patient outcome is not compromised. Comprehensive preoperative and ongoing assessment must be carried out to ensure optimal clinical decision-making.

## Training Program in Gasless Laparoscopy for Rural Surgeons of India: Evaluation and Cost Analysis

*Noel Aruparayil, MD, Jesudian Gnanaraj, MCh, Sukumar Maiti, MCh, Manish Chauhan, PhD, Aaron Quyn, PhD, Bonnie Cundill, MSc, Bryony Dawkins, MSc, Bethany Shinkins, PhD, Julia Brown, MSc, David Jayne, MD*
Leeds Institute of Medical Research at St. James's, University of Leeds, Leeds, United Kingdom
Karunya University, Coimbatore, India
Kolkata Medical College, Kolkata, India
Department of Electronic and Electrical Engineering, University of Leeds, Leeds, United Kingdom
Leeds Institute of Clinical Trials Research, University of Leeds, Leeds, United Kingdom
Academic Unit of Economics, Leeds Institute of Health Science, University of Leeds, Leeds, United Kingdom

WITHDRAWN