Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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among the priorities to address which could be supported by One Health strategies.

A OHCF has been developed with a multidisciplinary effort to facilitate detection of threats at the human-animal-environment interface, assess risks for pandemic, support evaluation of possible impacts and provide input for prevention. The OHCF aims at guiding the relevant national sectors towards harmonised and context driven OH strategies in prevention and preparedness and identifies priority actions for Governance, Data collection and analysis and Capacity building, both at national and international level.

**Conclusion:** At present, stand-alone national One Health plans are often developed, while the effort, in order to benefit from One Health approaches, should be to appropriately integrate One Health strategies into relevant national and international plans.

It is therefore necessary to develop adequate frameworks and identify procedures that allow this integration and effective implementation of comprehensive prevention and preparedness strategies.

The adoption of the proposed OHCF would facilitate the development of intersectoral data sharing and analysis platforms and support decision-making based on early signals which contemplate possible uncertainties.

The OHCF will facilitate operationalisation of OH in prevention and preparedness and will guide assessment of the multiple potential risk factors involved before they became a threat.

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**Topic 24: Outbreak Control and Response Logistic Challenges**

**PS24.01 (1036)**

**SARS-CoV-2, Lung Protective Ventilation, Low Middle Income Countries, and Pediatric Intensivists as Cross Disciplinary Knowledge Translation and Implementation Science Specialists**

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**Purpose:** We hypothesized that despite the low incidence of severe SARS-CoV-2 infections in children in Guyana, due to their specific skillset in lung protective ventilation, our Pediatric Intensivists were uniquely positioned to address significant training and readiness gaps in our colleagues attending a surging critically ill Adult COVID-19 patient population.

**Methods & Materials:** In Guyana, there are few clinicians trained in Critical-Care Medicine (CCM). The high incidence of ventilator dependence in seriously ill SARS-CoV2 patients, combined with a dearth of CCM practitioners competent in complex mechanical ventilation management left Guyana ill prepared to manage these patients. This knowledge deficit was further exacerbated in that many clinicians at our National Infectious Diseases Hospital were co-opted into CCM roles from other specialties with little to no CCM training. We have a very small core of Pediatric Surgical Critical Care Medicine staff that was formally trained in PCCM outside of Guyana. This core was instrumental in establishing a unique and formal Pediatric Critical-Care Medicine Micro-Modular Fellowship (PCCM-MMF) program that allowed the creation of Guyana’s only Pediatric ICU. A significant number of that core are also involved in Guyana’s National COVID Task Force. Given that all graduates of our PCCM-MMF program are extensively trained in Lung Protective Ventilation, it was very appropriate to utilize them to augment Adult critical care capacity. Thirty physicians with primarily adult practices and little to no previous knowledge of ventilator management were enrolled in a multi-modal triphasic mechanical ventilation short course facilitated by PCCM staff.

**Results:** We were able to rapidly enable two cohorts of 15 Adult clinicians to competently address critical knowledge deficits and staffing shortfalls. We improved morbidity and mortality amongst our mechanically ventilated adult COVID-19 patients, as well as relieved significant multifactorial caregiver strain.

**Conclusion:** Our successful utilization of PCCM staff as Mechanical Ventilation didactic and clinical educators for an Adult patient population carries implications for cross disciplinary Knowledge Translation and Implementation Science in a wide variety of practice milieus. We are actively pursuing research opportunities to further experiment with other skill sets incorporated in our PCCM Micro-Modular Fellowship and welcome potential collaborators.

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**Topic 25: Outbreak Modeling and Forecasting**

**OP25.01 (570)**

**Prediction of hospital-onset COVID-19 using networks of patient contact: an observational study**

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**Purpose:** Predicting healthcare-acquired infections (HAI s) has the potential to revolutionise the prevention and control of transmissible infections. Existing prediction models for HAI s, however, fail to capture fully the contact-driven nature of infectious diseases. Here, we investigate the epidemiological predictivity of patient contact patterns through a forecasting model for hospital-onset COVID-19 infection (HOCI).

**Methods & Materials:** Our cohort comprises all patient admissions at a large London NHS Trust between 1/04/2020 and 1/04/2021. For patients, we consider (i) their hospital pathway, (ii) patient contacts, and (iii) date of COVID-19 infection. We consider rolling 14-day windows and forecast patient infection over the subsequent 7 days. Over each window, we construct a patient contact network and compute network features that capture contact centrality. We then combine network features, hospital environmental variables and patient clinical data to predict subsequent infections.

**Results:** A total of 51,157 patient admissions/episodes were observed during the study. Across all models, we find that contact-network features showed the highest performance (0.91 AUC-ROC). A reduced model with the six most predictive variables was almost as predictive and contained five features from patient contact (including direct contact with and network proximity to infectious cases) and only one environmental variable (length of stay).

**Conclusion:** Our results reveal that the number of direct contacts and network proximity to infectious patient(s) are highly predictive of HOCI. Such contact-based risk factors are easily ex-
tracted from routinely collected electronic health records providing a highly accessible route to improve personalised disease prognostics in future models.

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PS25.01 (158)

A unified and flexible modelling framework for the analysis of malaria serology data

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**Purpose:** Serology data are an increasingly important tool in malaria surveillance, especially in low transmission settings where the estimation of parasite-based indicators is often problematic. Existing methods rely on the use of thresholds to identify seropositive individuals and estimate transmission intensity, while making assumptions about the temporal dynamics of malaria transmission that are rarely questioned. Here, we present a novel threshold-free approach for the analysis of malaria serology data which avoids dichotomization of continuous antibody measurements and allows us to model changes in the antibody distribution across age in a more flexible way.

**Methods & Materials:** We develop a unified mechanistic model which combines the properties of reversible catalytic and antibody acquisition models, and allows for temporally varying boosting and seroconversion rates. Additionally, as an alternative to the unified mechanistic model, we also develop an empirical approach to analysis where modelling of the age-dependency is informed by the data rather than biological assumptions. Using serology data from Western Kenya, we demonstrate both the usefulness and limitations of the novel modelling framework.

**Results:** The unified mechanistic model 1) eliminates the need to dichotomize continuous antibody measurements into seropositive and seronegative data, 2) removes assumptions about malaria transmission dynamics, 3) adds flexibility in how transmission intensity can be estimated using regression analysis, 4) incorporates age-dependency of the antibody distribution, and 5) allows for joint estimation of malaria transmission intensity from both the reversible catalytic and antibody acquisition models.

**Conclusion:** Our framework makes the best possible use of the data by avoiding the dichotomization of the continuous antibody measurements, a common practice in the analysis of malaria serology data. More importantly, the unified framework allows us to critically assess and evaluate assumptions on the dynamics of biological indicators of malaria transmission using a principled likelihood-based framework.

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PS25.02 (926)

Mathematical modelling of COVID-19: a systematic review and quality assessment in the early epidemic response phase

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**Purpose:** Epidemiological models have played a key role in informing national response strategies for the current COVID-19 pandemic. We aimed to identify how mathematical models were employed in the early phase of the pandemic, at a time of great epidemiological uncertainty, as well as to formally assess the quality of models used. Hence we aimed to identify areas for improvement in model-based decision-making for future unknown disease threats.

**Methods & Materials:** A systematic review of mathematical modelling studies estimating the epidemiological impact of COVID-19 (risk of importation/spread) and non-pharmaceutical interventions (NPI) was conducted. We systematically searched PubMed, Embase, and preprints in ARXiv, MedRxiv and bioRxiv. We adopted two published quality assessment frameworks to formally assess the extent in which modelling studies met minimal requirements for incorporation of uncertainty and good modelling practice.

**Results:** In total, 166 articles met our eligibility criteria. The vast majority (129 studies, 78%) of models evaluated the effectiveness NPIs. NPI effectiveness was predominantly modelled in China and Italy, but varied by global region. Asian studies largely evaluated the impact of quarantine and isolation (64 studies), whereas European modelling studies modelled the impact of containment (15 studies), quarantine of travellers, and the isolation of cases. Early models primarily concerned compartmental, deterministic frameworks using SEIR or variants of SEIR compartments (93 studies, 56%) assuming homogenous, symptomatic transmission. Incorporation of parameter uncertainty through model calibration (inference of unknown parameters by fitting models to data) and sensitivity analyses were relatively common (66% and 56% of studies respectively), the former mainly using Chinese data. In contrast, inclusion of structural uncertainty (uncertainty in disease characteristics) was relatively uncommon, as was validation of model output to external data.

**Conclusion:** This work allows for the identification of existing challenges in the mathematical modelling of emerging diseases, and emphasises minimal criteria for enhancing reliable model estimation and reporting. Limited availability of epidemiological data in the early phase of a new disease treat challenges model calibration to local, and validation to external data, emphasising the critical importance of enforcing standardised protocols for early epi-data collection, and raising awareness among modellers and decision-makers alike in handling uncertainty.

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PS25.03 (1085)

Real-Time Forecasting of COVID-19 Cases Using Human Mobility in Ontario, Canada

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**Purpose:** To minimize the impact of the COVID-19 pandemic, local public health authorities are often required to make prompt and informed decisions on anticipated case-loads, resource allocation for surveillance and testing, and public health intervention appropriateness. The objective of this research was to develop a near-term forecasting model to predict COVID-19 cases using real-time human mobility information in Ontario, Canada to assist public health authorities with outbreak response.

**Methods & Materials:** We utilized a deep neural network model to generate a short-term forecast of new COVID-19 cases by two weeks from May to August 2021. Variable selection was informed by a recent literature review and our ongoing research associating COVID-19 cases with human mobility, demographic and socio-economic factors. A real-time human mobility statistics consisting of a weekly summary of short and long-distance movement,