Contents

Volume 7 | Issue 2 | BMJ Innovations | April 2021

Editorial

247 Innovation will help us leave a positive health legacy from COVID-19

A McKinn

Innovations during COVID

249 One nudge for hand hygiene

D A Redelman, R H Thaler

253 Use of symptom checkers for COVID-19-related symptoms among university students: a qualitative study

S Alouef, S B Meyer, J R Wallace, S Mahajan, T Nur, A Chaurasia

261 Deep learning model to predict the need for mechanical ventilation using chest X-ray images in hospitalised patients with COVID-19


271 Rapid implementation of Inpatient eConsult Programme addresses new challenges for patient care during COVID-19 pandemic

S Rikin, E J Epstein, J Gendlina

278 Population eye health education using augmented reality and virtual reality: scalable tools during and beyond COVID-19

D V Ganasekeran, R Low, R Ganasekeran, B Chan, H Y Ong, D Raje, H Mi, C Pavesio, Q D Nguyen, R Agrawal

284 Virtual hackathon to tackle COVID-19 unmet needs

W S Bolton, S Ng, A Lam, J Kinch, V Parchment, W P Foster, M R Zimmermann, J Q Teh, A Simpson, K Sharma, R Kerstein, J Burke, S J Chapman, P R Culmer, D G Jayne, on behalf of the MedTech Foundation

288 Ingenuity during the COVID-19 pandemic: a controlled experiment for respirator mask efficacy testing

M Hausman, D Rybalke, P Nasser, D Laudier, D Charen, E Ferreri, J Iaridis, L Galatz

292 Negative pressure patient isolation device to enable non-invasive respiratory support for COVID-19 and beyond

A August, M Bolthouse, B Rice, J K Wall

297 Feasibility of manual ventilation replacing mechanical ventilation

M F Brady, N K Weber, R Walker, J D Holley, S A Ni, S Young, E D Monhollen, R S Carpenter, J W Tsao

302 Zero cost approach to fostering multidisciplinary engagement and innovation in an academic medical centre during COVID-19: experience from the Jugaar Innovation Challenge

R Ahmed, K Dayani, H A Amir, A Mian

308 Modified full-face snorkel mask: answer to the PPE crisis?

H D Measuria, Y V Verma, R Kerstein, S Tucker

311 Remote multidisciplinary heart team meetings in immersive virtual reality: a first experience during the COVID-19 pandemic


316 Enabling patient communication for hospitalised patients during and beyond the COVID-19 pandemic

S Ganesan, E Hsiang, T Peng, N Thomas, J Garcia-Grossman, K Javaherian, Z Lyon, A Vidyarthi

MORE CONTENTS ➤
321 Exploring the challenges and hidden opportunities of hosting a virtual innovation competition in the time of COVID-19
M El Akoum, M El Achi

327 Epidemiological impact of prioritising SARS-CoV-2 vaccination by antibody status: mathematical modelling analyses

337 The way forward after COVID-19 vaccination: vaccine passports with blockchain to protect personal privacy
K K F Tsok, J J Y Sung, H W Y Lee, K K L Yu, H Fung, S Y S Wong

342 Telemonitoring programme on COVID-19 for a low-income community in Brazil: case study
T U d S Graça, A L Santos, G Yamamoto, R W de Souza, M P P Srougé, R L Pacheco, C Lima, R Riera

C L Ochu, O W Akeende, O Oyetanbi, O Ademola, O Ogunbode, R Attech, T Ogbwor, E Ogianuo, O D'Angelo, E Hamrock, J Hineson, E Hoyer, T Dungarani, E Howell

356 End-to-end convolutional neural network enables COVID-19 detection from breath and cough audio: a pilot study
H Coppock, A Gaskell, P Tzirakis, A Baird, L Jones, B Schuller

363 MyCOVIDRisk app: development and utilisation of a COVID-19 risk assessment and mitigation application
E M Goldberg, C S Bingaman, S Perera, M L Ranney

368 Contact-tracing applications: a review of technologies
M Nazayer, S Madanian, F Mirza

379 Extending tubing to place intravenous smart pumps outside of patient rooms during COVID-19: an innovation that increases medication dead volume and risk to patients
J W C Blake, K K Giuliano, R D Butterfield, T Vanderveen, N M Sims

387 Applications and challenges of AI-based algorithms in the COVID-19 pandemic
D Khemasuwan, H G Colt

Medical devices

399 Using human-centred design to develop an innovative female condom
P S Coffey, M Killourne-Brook

407 Driving medtech innovation and start-up company formation through successful joint academic/commercial fellowship
F Sharif, I Quinn

Health technology assessment

414 Machine-learning-based hospital discharge predictions can support multidisciplinary rounds and decrease hospital length-of-stay
S Levin, S Barnes, M Toepfer, A D’Eنظe, M D’Angelo, E Hamrock, J Hineson, E Hoyer, T Dungarani, E Howell

Assistive technologies

422 Google translate in healthcare: preliminary evaluation of transcription, translation and speech synthesis accuracy
J Birkenbeuel, H Joyce, R Sahyouni, D Cheung, M Maducdoc, N Mostakhmi, S Sahyouni, H Djalilian, J Chen, H Lin

Early-stage innovation reports

430 Design and user experience of Noxeno: a novel nasal foreign body removal device
A Chandran, K Sikka, B Jat, P Kadambi, R D’Souza, R Kumar, A Thakar, S Sharma

434 Single-unit, wireless device for salivary stimulation
Rajkumar K, Ramya R, SwarnaLakshmi R

441 Development of a practical training method for a healthcare artificial intelligence (AI) chatbot

445 Use of a smart lip holder for minimally invasive minor salivary gland biopsy
A Dumusc, B Bannour, F Kellen, J Alvarez-Trompeter, T Hugle
## Contents

<table>
<thead>
<tr>
<th>Page</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>448</td>
<td>Pain alleviation during cryotherapy of plantar viral warts using a non-invasive vibratory device: a randomised individually controlled trial</td>
<td>Y P Koh, M M Chan, X Zhao, L Tan, H L Tey</td>
</tr>
<tr>
<td>452</td>
<td>Evaluating simple, affordable technology for ophthalmic diagnoses in rural Malawi: a potential tool to address skill shortage</td>
<td>A Noar, H Jeffery, J Hoffman</td>
</tr>
<tr>
<td>456</td>
<td>Assessing baseline practice and the implementation and efficacy of a novel device for medication security</td>
<td>H Young, M Z A Mariyaselvam, V Patel, J Gibson, E Hodges, N English, R Heij, G Wijewardena, D Pearson, M Blunt, P Yeung</td>
</tr>
<tr>
<td>470</td>
<td>New technique and device for controlled and continuous drug delivery into the brain: a proof-of-concept study</td>
<td>Anoop U R, K Verma</td>
</tr>
<tr>
<td>478</td>
<td>Simple working sheath for lumbar and lumbosacral spine: technical note</td>
<td>D K Jha, J S Gosal, J Ruparelia, N Kumar, T Sharma, P K Bhattia, P Khera</td>
</tr>
</tbody>
</table>

### Reviews

<table>
<thead>
<tr>
<th>Page</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>482</td>
<td>Double standards in healthcare innovations: the case of mosquito net mesh for hernia repair</td>
<td>M Skopec, A Grillo, A Kureshi, Y Bhatti, M Harris</td>
</tr>
<tr>
<td>491</td>
<td>Design thinking as an approach for innovation in healthcare: systematic review and research avenues</td>
<td>M Oliveira, E Zancul, A L Fleury</td>
</tr>
<tr>
<td>499</td>
<td>Agile Innovation to transform healthcare: innovating in complex adaptive systems is an everyday process, not a light bulb event</td>
<td>R J Holden, M A Boustani, J Azar</td>
</tr>
<tr>
<td>506</td>
<td>Blockchain, health disparities and global health</td>
<td>D Vervoort, C R Guetter, A W Peters</td>
</tr>
</tbody>
</table>

### Letter

<table>
<thead>
<tr>
<th>Page</th>
<th>Title</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>515</td>
<td>Novel disinfecting spittoons during COVID-19</td>
<td>M M Khan, S R Parab</td>
</tr>
</tbody>
</table>