**Reducing the environmental impact of surgery on a global scale: systematic review, co-prioritisation with healthcare workers in 132 countries**

*NIHR Global Health Research Unit on Global Surgery*

**Corresponding Author**

Mr Aneel BhanguNIHR Global Health Research Unit on Global Surgery, Institute of Applied Health Research, University of Birmingham, Birmingham B15 2TH, UK

**Orcid ID** 0000-0001-5999-4618

**Twitter** @aneelbhangu

**Supplementary Materials – Index**

|  |  |
| --- | --- |
|  |  |
| **Supplementary tables**  Supplementary table index  Supplementary tables  **Supplementary Appendixes** | Page 2  Page 3-15 |
| Appendix S1 – Authorship | Page 16-35 |

|  |  |
| --- | --- |
| **Supplementary table title** | **Pages** |
| **Table S1**: Search terms for systematic review | 3 |
| **Table S2.** Summary of included studies from the systematic review in phase 1 and references | 4-9 |
| **Table S3.** Summary of additional interventions identified from systematic review during Phase 1 that were combined into list from Table 2 | 10 |
| **Table S4.** Country of origin income group and job role of perioperative professionals and theatre managers from the global consultation surveys | 11 |
| **Table S5.** Additional interventions suggested by perioperative healthcare professionals in first global consultation survey, later combined into the final list of interventions | 12-14 |
| **Table S6.** Global consultation with healthcare professionals (Phase 1) | 15 |
| **Table S7.** Patient perceptions of reducing the carbon and environmental impact of surgery (UK only) | 16 |

**Supplementary tables**

**Table S1**. Search terms for systematic review

|  |  |  |
| --- | --- | --- |
|  | Search terms | Studies, n |
| 1 | exp Carbon Footprint/ | 10917 |
| 2 | Carbon Footprint.ti,ab. | 4966 |
| 3 | greenhouse gas emissions.ti,ab. | 18529 |
| 4 | exp Climate Change/ | 210664 |
| 5 | climate change.ti,ab. | 184637 |
| 6 | exp Global Warming/ | 44338 |
| 7 | global warming.ti,ab. | 38597 |
| 8 | life cycle assessment.ti,ab. | 14304 |
| 9 | 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 | 311741 |
| 10 | surgery.ti,ab. | 3004718 |
| 11 | exp General Surgery/ | 57659 |
| 12 | anaesthesia.ti,ab. | 163638 |
| 13 | operating theatre.ti,ab. | 8861 |
| 14 | exp Operating Rooms/ | 57907 |
| 15 | operating room.ti,ab. | 69053 |
| 16 | 10 or 11 or 12 or 13 or 14 or 15 | 3211173 |
| 17 | 9 and 16 | 356 |
| 18 | Carbon footprints.ti,ab. | 817 |
| 19 | 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 18 | 311919 |
| 20 | 16 and 19 | 356 |
| 21 | net-zero-carbon.ti,ab. | 63 |
| 22 | 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 18 or 21 | 311944 |
| 23 | 16 and 22 | 360 |

**Table S2.** Summary of included studies from the systematic review in phase 1 and references

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Study Name** | **Study Duration** | **Patients** | **Country** | **Hospital Type** | **Study Setting** | **Study Type** | **Surgery Type** | **Description** | **Carbon Output** |
| **Scope I** |  |  |  |  |  |  |  |  |  |
| Mehta 19751 | NR | NR | UK | NR | NR | NR | NR | Scavenging systems | No reporting on impact to carbon emissions |
| Barwise 20112 | NR | NR | USA | Academic | Single centre | PCS | All surgery | Scavenging systems | Reduced waste anaesthetic scavenging flows and reduced energy costs |
| Tay 20133 | NR | 3675 | Australia | District / Community | Single centre | PCS | NR | Automated control of end-tidal gases | Reduced carbon emissions by 44% |
| Boyle 20184 | Dec 2017 - Mar 2018 | NR | UK | District / Community | Single centre | PCS | NR | Use of sevofluorane over desflorane | 81% decrease in carbon emissions from 394,126 kg to 74,004 kg |
| Belford 20195 | NR | NR | Australia | Academic | Single centre | PCS | NR | Anaesthetic Gas - reduction in desflurane use | - |
| van der Griend 20196 | Dec 2017 - Jan 2018 | 94 | Canada | Community | Single centre | RCS | Paediatric | Use of TIVA | No reporting on impact to carbon emissions |
| Zuegge 20197 | NR | NR | USA | Academic | Single centre | PCS | NR | Use of sevofluorane over desflorane | Reduction in carbon emissions by 80% - 90% |
| Caycedo-Marulanda 20208 | Jan 2017 - June 2018 | 63 | Canada | Academic | Single centre | RCS | Colorectal | Anaesthetic gas change | Carbon reduction >90% with sevofluorane |
| Richter 20209 | Jan 2017 - Dec 2018 | 20856 | Germany | Academic | Multi-centre | PCS | All surgery | Volatile anaesthetics - sevoflurane & desflurane | Reduction of two-thirds of carbon output |
| Back 202110 | Oct-20 | 58 | UK | Academic | Single centre | PCS | NR | Fresh gas flow rates in TIVA | Cost reduction of more than £8000/year |
| Carta 202111 | NR | NR | UK | District / Community | Single centre | PCS | NR | Anaesthetic Gas - reduction in desflurane use | Reduction in carbon emissions by 74% |
| Craven 202112 | NR | 280 | UK | Academic | Single centre | PCS | NR | Use of TIVA | No reporting of carbon emissions reduction |
| Herbert 202113 | Mar 2020 - May 2020 | NR | UK | Academic | Single centre | RCS | NR | Anaesthetic Gas - reduction in desflurane use | Reduction in carbon emissions by 229,082 kg |
| Jameson 202114 | NR | NR | UK | Academic | Single centre | PCS | NR | Low flow rates | No reporting on carbon emissions |
| Kirkman 202115 | Sep 2020 - Feb 2021 | NR | UK | Academic | Single centre | PCS | NR | Anaesthetic Gas - reduction in desflurane use | Reduction in carbon emissions by >34,000kg |
| Thiel 201816 | Sep 2015 - Dec 2016 | 17 | USA | Academic | Single centre | PCS | Hysterectomy | Use of desfluorane, recycling, reusable instruments; HVAC | Reducing N20 reduced carbon emissions by 25%, recycling & reusable materials by 5% |
| **Scope II** |  |  |  |  |  |  |  |  |  |
| Agrawal 201017 | Dec 2008 - Aug 2009 | 71 | India | Academic | Single centre | PCS | NR | Avoid energized equipment | - |
| Practice Greenhealth 201818 | Jan 2017 - Dec 2017 | NR | USA | NR | Multi-centre | RCS | NR | Reducing air exchange - 20 times-an-hour to 6 times-an-hour when ORs are not in use | Saved $2 million/year |
| Practice Greenhealth 202119 | Jan 2021 - Dec 2021 | NR | USA | Academic | Single centre | RCS | NR | HVAC occupancy sensers in 2 of their ORs | Reduced energy use by 25,000 kW per hour and savings of $4000 dollars per year |
| Practice Greenhealth 202120 | Jan 2021 - Dec 2021 | NR | USA | NR | Multi-centre | RCS | NR | Replaced fluorescent lamps with LEDs in 10,500 coffers | Reduced electric consumption by 28.6 million kW per year. |
| **Scope III** |  |  |  |  |  |  |  |  |  |
| Dettenkofer 199921 | NR | NR | Germany | Academic | Single centre | PCS | NR | Reusable drapes | No reporting of carbon emissions reduction |
| DeBois 2013 22 | NR | 400 | USA | Academic | Single centre | PCS | Transplant Surgery | Diverting bypass circuits from the traditional regulated medical waste | Reduction in waste by 7.5 tons and carbon output |
| Southourn 2019 23 | NR | 44 | UK | NR | Multi-centre | PCS | Orthopaedic | Recycling waste | Reduction in carbon emissions by 75% & savings of £420,000 per year |
| Wormer 2013 24 | NR | NR | USA | Academic | Single centre | PCS | NR | Recycling waste | Reduction by 234.3 metric tons |
| Lui 2014 25 | Sep 2012 - April 2013 | 97 | Canada | Academic | Single centre | PCS | Head and Neck | Recycling waste | No reporting on impact to carbon emissions |
| McGain 2017 26 | NR | NR | Australia | District / Community | Single centre | PCS | NR | Reusable anaesthetic equipment | Increased carbon emissions by 10% |
| Sadler 201727 | NR | NR | UK | District / Community | Single centre | PCS | NR | Recycling waste | Reduction by 1500kg |
| Nesaratnam 2018 28 | Dec 2017 | 121 | UK | District / Community | Single centre | PCS | NR | Recycling | No reporting of carbon emissions reduction |
| Connolly 2019 29 | NR | NR | Australia | District / Community | Single centre | PCS | NR | Recycling waste | - |
| Jandu 202030 | NR | NR | UK | Academic | Single centre | PCS | NR | Recycling of waste | Reduction of clinical waste by 19,320 kg/year |
| Jabouri 202131 | 2019 | 62 | UK | Academic | Single centre | PCS | NR | Reusable surgery packs | Reduction of carbon emissions by 6% |
| Vozzola 2020 32 | NR | NR | USA | NR | NR | PCS | NR | Resuable gowns - compared to disposable gowns | Reduced natural resource energy consumption by 64%, greenhouse gas emissions by 66%, blue water consumption by 83%, and solid waste generation by 84% as compared with disposable gowns |
| Bhatter 2021 33 | NR | 34 | USA | Academic | Single centre | PCS | Plastics | Recycling | No reporting on impact to carbon emissions |
| Putri 2021 34 | NR | NR | UK | NR | NR | RCS | Opthalmology | Use of non-disposable instruments | No reporting on impact to carbon emissions but cost savings of £27,660 / year |
| Rizan 2021 35 | Apr 2017 - Mar 2018 | NR | United Kingdom | Academic | Single centre | RCS | NR | Steam sterilisation - Packaging reusable surgical instruments | Reduction in carbon emissions by 6% - 12% |
| Vacharathit 2021 36 | - | NR | USA | Academic | Single centre | PCS | NR | Recycling waste | - |

**References**

1. Mehta S, Cole WJ, Chari J, Lewin K. Operating room air pollution: influence of anaesthetic circuit, vapour concentration, gas flow and ventilation. *Can Anaesth Soc J*. May 1975;22(3):265-74. doi:10.1007/BF03004835

2. Barwise JA, Lancaster LJ, Michaels D, Pope JE, Berry JM. Technical communication: An initial evaluation of a novel anesthetic scavenging interface. *Anesth Analg*. Nov 2011;113(5):1064-7. doi:10.1213/ANE.0b013e31822c9a2c

3. Tay S, Weinberg L, Peyton P, Story D, Briedis J. Financial and environmental costs of manual versus automated control of end-tidal gas concentrations. *Anaesth Intensive Care*. Jan 2013;41(1):95-101. doi:10.1177/0310057X1304100116

4. Boyle A, Coleman A, Barker K. A grassroots approach to the greenhouse effect: implementing recent guidance from the AAGBI and RCoA. presented at: Association of Anaesthetists Annual Congress 2018; Dublin, Ireland. Raigmore Hospital, Inverness

5. Belford I, Hardy J, Rodney G, et al. Bin the blue gas! Should we and why? Abstract presented at: Association of Anaesthetists Annual Congress 2019; Glasgow.

6. van der Griend BF, Vincent AR, Kennedy RR. Observational audit of sevoflurane consumption during paediatric anaesthesia. *Anaesth Intensive Care*. May 2019;47(3):251-254. doi:10.1177/0310057X19841008

7. Zuegge KL, Bunsen SK, Volz LM, et al. Provider Education and Vaporizer Labeling Lead to Reduced Anesthetic Agent Purchasing With Cost Savings and Reduced Greenhouse Gas Emissions. *Anesth Analg*. Jun 2019;128(6):e97-e99. doi:10.1213/ANE.0000000000003771

8. Caycedo-Marulanda A, Caswell J, Mathur S. Comparing the environmental impact of anesthetic gases during transanal total mesorectal excision surgery at a tertiary healthcare centre. *Canadian Journal of Anesthesia/Journal canadien d'anesthésie* 2020;67:607-608. doi:<https://doi.org/10.1007/s12630-019-01527-0>

9. Richter H, Weixler S, Schuster M. The carbon footprint of anaesthesia: How the choice of volatile anaesthetic affects the CO2 emissions of a department of anaesthesiology. *Anasthesiologie und Intensivmedizin*. 2020;61(5):154-161. doi:10.19224/ai2020.154

10. Back M, Al-Attar A, Sutton R, et al. Fresh gas flow during total intravenous anaesthesia and marginal gains in sustainable healthcare. Comment on Br J Anaesth 2020. *British Journal of Anaesthesia*. 2020;126(4):773-778. doi:<https://doi.org/10.1016/j.bja.2020.12.006>

11. Carta S, Biela C, C B. Cleaning up our act: Volatile anaesthesia post-pandemic. presented at: Association of Anaesthetists Winter Scientific Meeting; 2021; Virtual.

12. Craven T, Dua K, Evans E, et al. Sustainability in general anaesthesia: Attitudes and capability regarding inhalational gas versus total intravenous anaesthesia. presented at: Association of Anaesthetists Trainee Conference 2021; 2021; Newcastle.

13. Herbert E, Watts A. A quality-improvement project investigating the carbon offset, courtesy of a global pandemic. presented at: Association of Anaesthetists Winter Scientific Meeting; 2021; Virtual.

14. Jameson R, Young S. Raising the standard: Lowering the flow. Glasgow Royal Infirmary trainee group collaborative audit. presented at: Association of Anaesthetists Trainee Conference 2021; 2021; Newcastle.

15. Kirkman J, Mathur R, McHugh C. Volatile anaesthesia: Reducing the financial cost and environmental impact by reducing desflurane usage. presented at: Association of Anaesthetists Annual Congress 2021; 2021; Virtual.

16. Thiel CL, Woods NC, Bilec MM. Strategies to Reduce Greenhouse Gas Emissions from Laparoscopic Surgery. *Am J Public Health*. Apr 2018;108(S2):S158-S164. doi:10.2105/AJPH.2018.304397

17. Agrawal B, Tapish A, Mahajan K. Carbon footprint of laparoscopic cholecystectomy performed with or without energized dissection-a case controlled study. 2010;

18. Practice Greenhealth. The value of sustainability initiatives in surgical suites. <https://practicegreenhealth.org/sites/default/files/upload-files/2018.gor_.report.pdf>

19. Practice Greenhealth. Providence St. Peter Hospital, Olympia, WA: Energy Efficiency in the OR - HVAC Setback Program. 2021;

20. Practice Greenhealth. The Business Case for Greening the OR. <https://practicegreenhealth.org/sites/default/files/upload-files/caseforgor_r5_web_0.pdf>

21. Dettenkofer M, Griesshammer R, Scherrer M, Daschner F. [Life-cycle assessment of single-use versus reusable surgical drapes (cellulose/polyethylene-mixed cotton system)]. *Chirurg*. Apr 1999;70(4):485-91; discussion 491-2. Einweg- versus Mehrweg-Patientenabdeckung im Operationssaal. Okobilanz: Vergleich von Zellstoff-Polyethylen- und Baumwoll-Mischabdeckung. doi:10.1007/s001040050677

22. Debois W, Prata J, Elmer B, et al. Improved environmental impact with diversion of perfusion bypass circuit to municipal solid waste. *J Extra Corpor Technol*. Jun 2013;45(2):143-5.

23. Southorn T, Norrish AR, Gardner K, Baxandall R. Reducing the carbon footprint of the operating theatre: a multicentre quality improvement report. *J Perioper Pract*. Jun 2013;23(6):144-6. doi:10.1177/175045891302300605

24. Wormer B, Augenstein V, Carpenter C, et al. The green operating room: simple changes to reduce cost and our carbon footprint. *The American surgeon*. 2013;79,7:666-71.

25. Lui JT, Rudmik L, Randall DR. Reducing the preoperative ecological footprint in otolaryngology. *Otolaryngol Head Neck Surg*. Nov 2014;151(5):805-10. doi:10.1177/0194599814544449

26. McGain F, Story D, Lim T, McAlister S. Financial and environmental costs of reusable and single-use anaesthetic equipment. *Br J Anaesth*. Jun 1 2017;118(6):862-869. doi:10.1093/bja/aex098

27. Sadler A, Wilde P, Raju P. Metal recycling in healthcare waste management. 2018. <https://anaesthetists.org/Portals/0/PDFs/Anaesthesia%20News%20PDFs/2018/Anaesthesia_News_May_2018.pdf?ver=2018-08-02-162542-057>

28. Nesaratnam A, Jani K, Follett T. Sustainability in Anaesthesia: A Service Evaluation of Theatre Waste Recycling. presented at: East Anglian Association of Anaesthetists Core Topics 2018 and Harold Youngman Prize Meeting; 2018;

29. Connolly M, Rathi S. A Novel Method of Recycling in Wollongong Operating Theatres. presented at: Austrialian Society of Anaesthetists Conference 2019; 2019; Sydney. <http://asa2018.com.au/wp-content/uploads/2018/10/49-A-Novel-Method-of-Recycling-in-Wollongong-Operating-Theatres.pdf>

30. Jandu A. Recycling and greener anaesthesia at Mid Essex Hospital NHS Trust: quality-improvement project. presented at: Association of Anaesthetists Winter Scientific Meeting; 2020; London. Session S2.

31. Jabouri H, Abbott RA. Sustainability in skin cancer surgery. *British Journal of Dermatology*. 2022;186(4):735-736. doi:<https://doi.org/10.1111/bjd.20886>

32. Vozzola E, Overcash M, Griffing E. An Environmental Analysis of Reusable and Disposable Surgical Gowns. *AORN J*. Mar 2020;111(3):315-325. doi:10.1002/aorn.12885

33. Bhatter P, Cypen S, Carter S, et al. Pharmaceutical and Supply Waste in Oculofacial Plastic Surgery at a Hospital-Based Outpatient Surgery Center. *Ophthalmic plastic and reconstructive surgery* 2021;37,5 435-438. doi:10.1097/IOP.0000000000001891

34. Putri CA, Rezai P, Capel J, et al. Money, environment and eyelids. *Eye (Lond)*. Sep 2021;35(9):2653-2654. doi:10.1038/s41433-020-01189-z

35. Rizan C, Lillywhite R, Reed M, et al. Minimising carbon and financial costs of steam sterilisation and packaging of reusable surgical instruments. *Br J Surg*. Feb 1 2022;109(2):200-210. doi:10.1093/bjs/znab406

36. Vacharathit Vea. Action in Healthcare Sustainability is a Surgical Imperative: This is a Novel Way to Do It. *Journal of surgical education*. 2022;79,2:275-278. doi:10.1016/j.jsurg.2021.09.002

**Table S3.** Summary of additional interventions identified from systematic review during Phase 1 that were combined into list from Table 2

|  |  |
| --- | --- |
|  | **Combined into final list of interventions** |
| **Scope 1** | |
| Reduce isoflurane\* | Reduce the use and wastage of anaesthetic gases |
| Increase sevoflurane | Reduce the use and wastage of anaesthetic gases |
| Increase regional anaesthesia | Reduce the use of general anaesthesia |
| Use of scavenging systems | Reduce the use and wastage of anaesthetic gases |
| Extended duration of anaesthetics circuit | Reduce the use and wastage of anaesthetic gases |
| Small canisters for gas cylinders | Reduce the use and wastage of anaesthetic gases |
| Manual vs automated ET control | Reduce the use and wastage of anaesthetic gases |
| Turning off excessive gas flows and vaporisers following an anaesthetic | Reduce the use and wastage of anaesthetic gases |
| Careful filling of vaporisers | Reduce the use and wastage of anaesthetic gases |
| Judicious checking of all connections along the anaesthesia circuit and at the machine | Reduce the use and wastage of anaesthetic gases |
| Using properly fitting face masks and inflated endotracheal tube and laryngeal mask airway cuffs | Reduce the use and wastage of anaesthetic gases |
| **Scope 2** | |
| Reducing air exchange when OR not in use | Reduce energy and water use |
| **Scope 3** | |
| Reusable needle/sharp containers | Reduce consumables used |
| Steam sterilisation | Reduce energy and water use |
| No routine preoxygenation | Reduce the use and wastage of anaesthetic gases |
| Donating unused medical equipment and supplies to medical missions | Reduce consumables used |
| Using prefilled medication syringes | Reduce consumables used |
| Partnering with industry to promote greener packaging practices | Increase use of consumables that can be easily recycled |
| Reuse sterile paper for the C-arm | Introduce reusable surgical gowns and drapes |

**Table S4.** Country of origin income group and job role of perioperative professionals and theatre managers from the global consultation surveys

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Feature** | **Round 1** | | **Round 2** | |
| **n=3042** | | **n=5218** | |
| **World Bank Country Income classification** | | | | |
| High income countries | 1,928 | 64.00% | 2923 | 56.00% |
| Low- and middle-income countries | 1085 | 36.00% | 2295 | 44.00% |
| Low-income countries | 84 | 2.80% | 282 | 5.40% |
| Lower middle-income countries | 512 | 17.00% | 986 | 18.90% |
| Upper middle-income countries | 489 | 16.20% | 1027 | 19.70% |
| Missing | 29 |  | 0 |  |
| **Respondent type** | | | | |
| Anaesthetist, consultant | 189 | 6.70% | 349 | 6.80% |
| Anaesthetist, trainee | 71 | 2.50% | 125 | 2.40% |
| Nurse | 28 | 1.00% | 59 | 1.10% |
| Operating department practitioner | 18 | 0.60% | 91 | 1.80% |
| Physician assistant | 57 | 2.00% | 233 | 4.50% |
| Surgeon, consultant | 1620 | 57.40% | 2704 | 52.40% |
| Surgeon, trainee | 826 | 29.20% | 1567 | 30.40% |
| Theatre manager / stores | 15 | 0.50% | 34 | 0.70% |
| Missing | 218 |  | 56 |  |

**Table S5.** Additional interventions suggested by perioperative healthcare professionals in first global consultation survey, later combined into the final list of interventions

|  |  |
| --- | --- |
|  | **Interventions** |
| 1 | Reducing use of printed materials/ paper |
| 2 | Reusable theatre hats |
| 3 | Reusable masks |
| 4 | Ordering restock in bulk |
| 5 | Maximising use of available theatres |
| 6 | Turning off ventilation systems at night |
| 7 | Installation of CO2 pipes instead of refillable cylinders |
| 8 | Green champions / education of theatre staff |
| 9 | Battery recycling |
| 10 | Reducing the number of people in theatre |
| 11 | Glass recycling |
| 12 | Scavenging of anaesthetic gasses |
| 13 | Using battery powered rather than wired instruments |
| 14 | Reusing warm-air blankets |
| 15 | Switching general to regional or local anaesthesia |
| 16 | Increasing day case surgery |
| 17 | Turning off ventilation systems at night |
| 18 | Installing piped gas supply rather than using cylinders |
| 19 | Reducing single use energy devices / reusing devices |
| 20 | Reducing single use staplers / reusing devices |
| 21 | Reducing use of prepacked gauze |
| 22 | Waste audits |
| 23 | Automated soap dispensers |
| 24 | low-dose protocols for angiography |
| 25 | No overshoe covers |
| 26 | Use of reusable slippers |
| 27 | Using only a single layer of gloves |
| 28 | Turning off Suction when not needed |
| 29 | Attaching fume suction to Electrocautery etc |
| 30 | Reusable, personal visors/goggles |
| 31 | Only disposing of what has to go in biohazard bins in those bins |
| 32 | Dont open anything until surgeon asks for this |
| 33 | Using cell saver |
| 34 | Resusable instruments |
| 35 | Reducing suture use |
| 36 | Reducing operating light use with using headlight |
| 37 | Use of resuable laryngoscope and oropharyngeal airways |
| 38 | Use of reusable operating light handles |
| 39 | Lowering pressure and flow of laparoscopic surgery |
| 40 | Shutting down equipment (e.g. computers |
| 41 | Using leftover suture/ equipment for training |
| 42 | Reusing sterile clothes |
| 43 | Alcohol based hand wash for surgical scrubbing (that does not require running water) |
| 44 | Running the forced air warmer on the medium flow settings (same results as high low) |
| 45 | Electronic/re-usable chest drain system (e.g. Thopaz) |
| 46 | Sharp Recyclings |
| 47 | Upcycling device packaging |
| 48 | Reusing single-use instruments |
| 49 | Reducing use of ventilated whole body suits for orthopaedic surgery |
| 50 | Using dissolvable sutures instead of metal staples to close wounds |
| 51 | Using single absorbable dressings instead of multiple pressure dressings |
| 52 | Use of biodegradable disposables (e.g. syringes) |
| 53 | Use of an electronic (rather than paper theatre booking system) |
| 54 | Reusable sharps bins |
| 55 | Reusable diathermy probes/kit |
| 56 | Reusable goggles/eyewear |
| 57 | Automatic on/off taps for handwashing |
| 58 | Reusable suction devices |
| 59 | Reusable instrument packaging |
| 60 | Only opening instruments when verified for use by surgeons |
| 61 | Reducing ease of access to high impact devices/instruments in OR |
| 62 | Reusable bedsheets and gowns for patients |
| 63 | Reusable diathermy mat |
| 64 | Reusable external fixators |
| 65 | Fully digital electronic patient and imaging records |
| 66 | Reusable marking pens |
| 67 | Powering theatres using solar panels |
| 68 | Computers switched off overnight + energy saving in day |
| 69 | Use of a smoke evacuation system |
| 70 | Electronic/AI driven theatre product inventory |
| 71 | Automatic soap/alcohol gel dispensers for handwashing |
| 72 | Audit/QA of gas leaks from source to patient |
| 73 | Forum for local discussion of sustainability ideas |
| 74 | Multi-specialty operating theatres |
| 75 | Ventilation with heat rescue functionality |
| 76 | Intelligent use of operating theatre capacity to ensure maximal patient throughput |
| 77 | Reducing use of in-theatre catheterisation |
| 78 | Reuse calf compression devices (VTE prophylaxis) |
| 79 | Remove disposal cups/plates/cutlery from theatre coffee rooms |
| 80 | Reducing packaging for gowns |
| 81 | Resterilisation of single use equipment |
| 82 | Use of HEPA filters |
| 83 | Having a translucent rooftop that allows in light |
| 84 | Reducing use of plastic PPE |
| 85 | Reducing hand washing when not required |
| 86 | Recycling metal (e.g. metallic intubation blades) |
| 87 | Reduce mesh use |
| 88 | Hospital should have incinerator |

**Table S6.** Global consultation with healthcare professionals (Phase 1)

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Overall** | **HIC** | **LMIC** |
| **Sustainability leads in place** | | | |
| None | 61.4% | 62.7% | 59.3% |
| Hospital lead only | 23.8% | 24.5% | 22.8% |
| Theatre lead only | 11.6% | 10.0% | 14.1% |
| Both Hospital + Theatre leads | 3.2% | 2.8% | 3.8% |
| **Hospital net zero target** | | | |
| Yes | 15.6% | 15.6% | 15.7% |
| No | 84.4% | 84.4% | 84.3% |
| **Written green surgery plan** | | | |
| Yes | 15.5% | 14.4% | 17.0% |
| No | 84.5% | 85.6% | 83.0% |
| **I care about the environmental impact of the OR** | | | |
| Agree | 95.0% | 95.6% | 93.9% |
| Disagree | 5.0% | 4.4% | 6.1% |
| **I am willing to change my practice in the OR to reduce its environmental impact** | | | |
| Agree | 96.5% | 97.6% | 94.6% |
| Disagree | 3.5% | 2.4% | 5.4% |
| **I have enough information about the environmental impact of the OR to inform my decisions** | | | |
| Agree | 44.7% | 32.7% | 66.7% |
| Disagree | 55.3% | 67.3% | 33.3% |

**Table S7.** Patient perceptions of reducing the carbon and environmental impact of surgery (UK only)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Statement** | **Agreement** | **Patient  (previous surgery)** | **Patient  (awaiting surgery)** | **Public** | **Total** |
| I care both about the carbon footprint of my operation and my care around the time of surgery | Strongly agree | 28 (44.4) | 1 (33.3) | 5 (55.6) | 34 (45.3) |
| Agree | 25 (39.7) | 1 (33.3) | 4 (44.4) | 30 (40.0) |
| Neutral | 4 (6.3) | 1 (33.3) | 0 (0.0) | 5 (6.7) |
| Disagree | 1 (1.6) | 0 (0.0) | 0 (0.0) | 1 (1.3) |
| Strongly disagree | 5 (7.9) | 0 (0.0) | 0 (0.0) | 5 (6.7) |
| Reducing the carbon footprint of operating theatres is important to my community, family & friends | Strongly agree | 18 (28.6) | 1 (33.3) | 4 (44.4) | 23 (30.7) |
| Agree | 33 (52.4) | 1 (33.3) | 5 (55.6) | 39 (52.0) |
| Neutral | 7 (11.1) | 1 (33.3) | 0 (0.0) | 8 (10.7) |
| Disagree | 1 (1.6) | 0 (0.0) | 0 (0.0) | 1 (1.3) |
| Strongly disagree | 4 (6.3) | 0 (0.0) | 0 (0.0) | 4 (5.3) |
| I would support changes to reduce the environmental impact of my operation if the safety and effectiveness of surgery was the same or better | Strongly agree | 43 (68.3) | 2 (66.7) | 8 (88.9) | 53 (70.7) |
| Agree | 16 (25.4) | 1 (33.3) | 1 (11.1) | 18 (24.0) |
| Neutral | 3 (4.8) | 0 (0.0) | 0 (0.0) | 3 (4.0) |
| Disagree | 0 (0.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| Strongly disagree | 1 (1.6) | 0 (0.0) | 0 (0.0) | 1 (1.3) |
| I would support changes to reduce the environmental impact of my operation if there was a slight increase in minor complications of surgery | Strongly agree | 1 (1.6) | 0 (0.0) | 2 (22.2) | 3 (4.0) |
| Agree | 15 (23.8) | 0 (0.0) | 1 (11.1) | 16 (21.3) |
| Neutral | 13 (20.6) | 1 (33.3) | 2 (22.2) | 16 (21.3) |
| Disagree | 22 (34.9) | 1 (33.3) | 4 (44.4) | 27 (36.0) |
| Strongly disagree | 12 (19.0) | 1 (33.3) | 0 (0.0) | 13 (17.3) |
| I would support changes to reduce the environmental impact of my operation even if there was an increased cost to the NHS | Strongly agree | 6 (9.5) | 1 (33.3) | 2 (22.2) | 9 (12.0) |
| Agree | 24 (38.1) | 1 (33.3) | 4 (44.4) | 29 (38.7) |
| Neutral | 13 (20.6) | 1 (33.3) | 2 (22.2) | 16 (21.3) |
| Disagree | 12 (19.0) | 0 (0.0) | 1 (11.1) | 13 (17.3) |
| Strongly disagree | 8 (12.7) | 0 (0.0) | 0 (0.0) | 8 (10.7) |
| Hospitals should publish general information about the measures they are taking to reduce the carbon footprint of surgery | Strongly agree | 27 (42.9) | 2 (66.7) | 7 (77.8) | 36 (48.0) |
| Agree | 18 (28.6) | 1 (33.3) | 1 (11.1) | 20 (26.7) |
| Neutral | 13 (20.6) | 0 (0.0) | 0 (0.0) | 13 (17.3) |
| Disagree | 2 (3.2) | 0 (0.0) | 1 (11.1) | 3 (4.0) |
| Strongly disagree | 3 (4.8) | 0 (0.0) | 0 (0.0) | 3 (4.0) |
| Patients should be told about the specific measures taken to reduce the carbon footprint of their operation during preoperative preparation | Strongly agree | 13 (20.6) | 1 (33.3) | 5 (55.6) | 19 (25.3) |
| Agree | 23 (36.5) | 0 (0.0) | 2 (22.2) | 25 (33.3) |
| Neutral | 14 (22.2) | 1 (33.3) | 0 (0.0) | 15 (20.0) |
| Disagree | 8 (12.7) | 1 (33.3) | 1 (11.1) | 10 (13.3) |
| Strongly disagree | 5 (7.9) | 0 (0.0) | 1 (11.1) | 6 (8.0) |
| Patients should be empowered make choices to reduce the carbon footprint of their operation as part of consent | Strongly agree | 16 (25.4) | 2 (66.7) | 6 (66.7) | 24 (32.0) |
| Agree | 19 (30.2) | 1 (33.3) | 1 (11.1) | 21 (28.0) |
| Neutral | 11 (17.5) | 0 (0.0) | 1 (11.1) | 12 (16.0) |
| Disagree | 8 (12.7) | 0 (0.0) | 0 (0.0) | 8 (10.7) |
| Strongly disagree | 9 (14.3) | 0 (0.0) | 1 (11.1) | 10 (13.3) |

**Supplementary Appendixes**

**Appendix S1 - Authorship**

***Writing group***

Adewale Adisa1, Michael Bahrami-Hessari2, Aneel Bhangu2, Christina George3, Dhruv Ghosh4, James Glasbey2\*, Parvez Haque5, JC Allen Ingabire6, Sivesh Kathir Kamarajah2, Laura Kudrna7, Virginia Ledda2, Elizabeth Li2\*, Robert Lillywhite8, Rohin Mittal9, Dmitri Nepogodiev2\*, Faustin Ntirenganya10, Maria Picciochi2, Joana Filipa Ferreira Simões2

\*Joint first authors

1 Department of Surgery, Obafemi Awolowo University, Ile-Ife, Nigeria

2 NIHR Global Health Research Unit on Global Surgery, Birmingham, UK

3 Department of Anesthesiology and Critical Care, Christian Medical College Ludhiana, India

4 Department of Pediatric Surgery, Christian Medical College Ludhiana, India

5 Department of Surgery, Christian Medical College Ludhiana, India

6 Department of Surgery, University Teaching Hospital of Kigali, University of Rwanda, Kigali, Rwanda

7 Institute of Applied Health Research, University of Birmingham, Edgbaston, Birmingham, UK

8 School of Life Sciences, University of Warwick, Warwick, UK

9 Department of Colorectal Surgery, Christian Medical College, Tamil Nadu, Vellore, India

10 Department of Surgery, School of Medicine and Pharmacy, College of Medicine and Health Sciences, University of Rwanda, Rwanda

***Patient advisory group***

M Bahrami-Hessari (PAG Manager), A Bhangu, L Booth (PAG Chair), R Elliot, J Glasbey, AS Kennerton, KL Pettigrove, L Pinney, H Richard, R Tottman, P Wheatstone, John W, D Wolfenden, J Simões, A Smith

***Collaborators***

A Emad Sayed, Aakansha Giri Goswami, Aamer Malik, Aaron Lawson Mclean, Abbas Hassan, Abd Jabar Nazimi, Abdallah Aladna, Abdalrahman Abdelgawad, Abdel Saed, Abdelfatah Abdelmageed, Abdelilah Ghannam, Abdelrahman Mahmoud, Abdul Alvi, Abdulaziz Ismail, Abdulhafiz Adesunkanmi, Abdulla Ebrahim, Abdullah Al-Mallah, Abdullah Alqallaf, Abdullah Durrani, Abdullah Gabr, Abdullahi Musa Kirfi, Abdulmalik Altaf, Abdulmjeed Almutairi, Abdulrahman J Sabbagh, Abdulrazak Ajiya, Abdurrahman Haddud, Abed Alfattah Mahmoud Alnsour, Abhinav Singh, Abhishek Mittal, Abigail Semple, Abiodun Adeniran, Abraham Negussie, Abraham Oladimeji, Abubakar Bala Muhammad, Abubaker Yassin, Abuzer Gungor, Achille Tarsitano, Adaiah Soibiharry, Adam Dyas, Adam Frankel, Adam Peckham-Cooper, Adam Truss, Adamu Issaka, Adel Mohamed Ads, Adeleke Akeem Aderogba, Ademola Adeyeye, Adesoji Ademuyiwa, Adham Sleem, Adrian Papa, Adriana Cordova, Adu Appiah-Kubi, Adullah Meead, Aeris Jane D. Nacion, Afieharo Michael, Agustin Albani Forneris, Agustin Duro, Agustin Rodriguez Gonzalez, Ahmad Altouny, Ahmad Ghazal, Ahmad Khalifa, Ahmad Ozair, Ahmad Quzli, Ahmad Haddad, Ahmad Faidzal Othman, Ahmad Shuib Yahaya, Ahmed Elsherbiny, Ahmed Nazer, Ahmed Tarek, Ahmed Abu-Zaid, Ahmed Al-Nusairi, Ahmed Azab, Ahmed Elagili , Ahmed Elkazaz, Ahmed Kedwany, Ahmed Mohammed Nuhu , Ahmed Sakr, Ahmed Shehta, Ahmed Shirazi, Ahmed Mohamed Ibrahim Mohamed , Ahmed Elshawadfy Sherif, Ahmed K. Awad, Ahmed M. Abbas, Ahmed Saber Abdelrahman, Ahmed Siddique Ammar, Ahmed Y Azzam, Ahmet Burak Ciftci, Ahmet Cem Dural, Ahmet Necati Sanli, Aida Cristina Rahy-Martín, Aida Rosita Tantri, Aimal Khan, Aiman Al-Touny, Aiman Tariq , Aimen Gmati, Ainhoa Costas-Chavarri, Aino Auerkari, Aitor Landaluce-Olavarria, Ajay Puri, Ajay Radhakrishnan, Akaninyene Eseme Ubom, Akhilesh Pradhan, Akif Turna, Akinfolarin Adepiti, Akira Kuriyama, Al-Faraaz Kassam, Ala Hassouneh , Alaa El-Hussuna, Alaa Habeebullah, Alaa Mohamed Ads, Alaa Mousli, Alan Biloslavo, Alan Hoang, Alan Kirk, Alasdair Santini, Alba Vazquez Melero, Albaro José Nieto Calvache, Albert Baduell, Albert Chan, Alberto Abrate, Alberto Balduzzi, Alberto Cabañero Sánchez, Alberto Navarrete-Peón, Alberto Porcu, Alberto Brolese, Alberto G Barranquero, Alberto Maria Saibene, Albushra Altayeb Adam, Aldo Vagge, Alejandra Jara Maquilón, Alejandro Leon-Andrino, Aleksandar Sekulić, Aleksandar Trifunovski, Aleksandro Mako, Alemayehu Ginbo Bedada, Alessandro Broglia, Alessandro Coppola, Alessandro Giani, Alessandro Grandi, Alessandro Iacomino, Alessandro Moro, Alessia D’amico, Alessia Malagnino, Alethea Tang, Alex Doyle, Alex Alfieri, Alex Haynes, Alex Wilkins, Alexander Baldwin, Alexander Heriot, Alexander Laird, Alexander Lazarides, Alexander O'connor, Alexander Trulson, Alexander Christopher Rokohl, Alexandra Caziuc, Alexandra Triantafyllou, Alexandre Anesi, Alexandrina Nikova, Alexandros Andrianakis, Alexandros Charalabopoulos, Alexandros Tsolakidis, Alexandru Chirca, Alexis P Arnaud, Alexis Rafael Narvaez-Rojas, Alfie Kavalakat, Alfio Spina, Alfonso Recordare , Alfredo Annicchiarico, Alfredo Conti, Alhassan Datti Mohammed, Ali Kocataş, Ali Almhimid , Ali Arnaout, Ali Fahmy, Ali Mangi, Ali Modabber, Ali Bilal Ulas, Ali Yasen Y. Mohamedahmed, Alice Frontali, Alice Moynihan, Alif Yunus, Aline Ahmad, Alistair J Kent, Almu'atasim Khamees, Aloy Okechukwu Ugwu, Alparslan Turan, Alsnosy Abdullah Khalefa Mohammed, Alvaro Navarro-Barrios, Alvaro Yebes, Álvaro Francisco Lopes De Sousa, Amabelle Moreno, Aman Sethi, Amanda Caroline Dawson, Amani Alsayd Abdulsalam Othman , Amanjot Kaur, Amanuel Wolde, Amedeo Antonelli, Amedeo Scifo , Ameen Alhamad, Amelia Davis, Amer Alderazi, Amer Harky, Amina Mohammed-Durosinlorun, Amina Seguya, Amina Okhakhu , Amine Chamakhi, Amine Sebai, Amine Souadka, Amir Asla, Amit Agrawal, Amit Persad, Amit Gupta, Amr Elgazar, Amruta Kulkarni , Amy Coates, Ana Ciscar Bellés, Ana Danic Hadzibegovic, Ana Jotic, Ana Kowark, Ana Martins, Ana Mejía Pineda, Ana Peral, Ana Sánchez Gollarte, Ana Senent-Boza, Ana Isabel Avellaneda Camarena, Ana M Castaño-Leon, Ana Maria Minaya Bravo, Ana María Gimeno Moro, Ana-Maria Musina, Ana-María Tapia-Herrero, Anai Kothari, Anand Gupta, Anand Raja, Anas Aljaiuossi, Anas Taha, Anass Mohammed Majbar, Anastasia Prodromidou, Anastasios Kanatas, Anaya Gupte, Andee Dzulkarnaen Zakaria, Andrea Balla, Andrea Barberis, Andrea Bondurri, Andrea Bottari, Andrea Costantino, Andrea Figus, Andrea Lauretta, Andrea Mingoli, Andrea Romanzi, Andrea Sagnotta, Andrea Scacchi, Andrea Picchetto, Andrea Estefania Cueto Valadez, Andrea-Pierre Luzzi, Andreas Älgå, Andreas Fontalis, Andreas Hecker, Andreas K Demetriades, Andreea-Madalina Serban, Andrei Bogdan Văcărașu, Andrej Cokan, Andres Isaza-Restrepo, Andrew Beamish, Andrew Schache, Andrew Stevenson, Andrew Yiu, Andrew J Cockbain, Andrey Litvin, Ane Abad-Motos, Angel Becerra, Ángel Cilleruelo Ramos, Angela Chiaradia, Angela Dell, Angela Romano, Angelo Pascale, Angelo Alessandro Marra, Angelos Dimas, Angelos Kolias, Anis Cerovac, Anish Koneru, Anisse Tidjane, Anita Eseenam Agbeko, Ankur Bajaj, Ankush Gosain, Anna Allan, Anna Carreras-Castañer, Anna D'amore, Anna Dare, Anna Maffioli, Anna Palepa, Anna Paspala, Anna Konney, Anna Nunzia Della Gatta, Anne-Cecile Ezanno, Anneza Yiallourou, Anthony Kinnair, Anthony Rayner, Anthony Kevin Scafa, Antoinette Bediako Bowan, Antonella Veglia, Antonino Russo, Antonino Maniaci, Antonio Castaldi, Antonio Gil-Moreno, Antonio Maffuz-Aziz, Antonio Meola, Antonio Nenna, Antonio Perez Ferrer, Antonio Ramos Bonilla, Antonio Ramos-De La Medina, Antonio Rodriguez Infante, Antonio Santoro, Antonio Simone Laganà, Antony Bateman, Antony Louis Rex Michael, Anwaar Abozid, Anwar Sadat Seidu, Aoife Lowery, Apichat Tantraworasin, Aqsa Rasheed, Arcangelo Picciariello, Arda Isik, Areeba Saif, Arfa Anjum, Argyrios Ioannidis, Ariel Abeldaño, Arif Hussain, Arjun Nathan, Arkady Bedzhanyan, Arkaitz Perfecto, Armando De Virgilio, Armando Galvan, Armin Sablotzki, Arne Böttcher, Arrigo Pellacani, Arthur Gatti, Arturan Ibrahimli, Arun Menon, Arun Sahni, Aruyaru Stanley Mwenda, Asad Choudhry, Asanka Jayawardane, Ashish Gupta, Ashok Ramasamy, Ashrarur Rahman Mitul, Ashvind Bawa, Ashwani Nugur, Ashwin Rammohan, Ashwin Sachdeva, Asif Mehraj, Asif Yildirim, Asma Alqaseer, Asmaa Radwan, Asser Sallam, Athanasios Syllaios, Athanasios Tampakis, Athari Alwael, Athina Samara, Atilla Eroglu, Atiqur Rahman, Attila Ulkucu, Attila Zaránd, Audrius Dulskas, Augustine Tawiah, Augusto Zani, Aurelia Vas, Ausra Lukosiute-Urboniene, Auwal Adamu, Avinash Aujayeb, Awais Amjad Malik, Ayberk İplikçi, Ayesha Mahmud, Aylin Pelin Cil, Ayomide Makanjuola, Ayoub Akwaisah, Aysuna Galandarova, Ayten Saracoglu, Azel Regan, Aziz Mutlu Barlas, Baba Alhaji Bin Alhassan, Badr Mostafa, Baha Ben Hamida, Bahar Canbay Torun, Bahiyah Abdullah, Balasingam Balagobi, Balazs Banky, Baljit Singh, Bamidele Alegbeleye, Banu Yigit, Baraa Nabil Hajjaj, Barbara Burgos-Blasco, Barbara Seeliger, Barnabas Alayande, Barrag Alhazmi, Bassey Enodien, Beatrice Torre, Beatriz Gómez Pérez, Beatriz Villota Tamayo, Beatriz De Andrés-Asenjo, Begoña Quintana-Villamandos, Behiç Girgin, Behrad Barmayehvar, Bekzat Beisenov, Ben Creavin, Ben Dunne, Ben Marson, Ben Waterson, Benjamin Martin, Benjamin Zucker, Benjamin Ngie Xiong Wong, Berk Baris Ozmen, Bernard Hammond, Bernard Mbwele, Bernardo Núñez, Bert Dhondt, Besma Gafsi, Bethan Mcleish, Bettina Lieske, Bhavesh Tailor, Biagia La Pira, Biagio Picardi, Biagio Zampogna, Biagio Casagranda, Bianca Maria Festa, Bijnya Panda, Bilal Kirmani, Bilal Sulaiman, Binay Gurung, Bincy Zacharia, Birgit Bette, Birhanu Ayana, Bisera Nikolovska, Blanca Capdevila Vilaró, Blanca De Vega Sánchez, Bm Zeeshan Hameed, Bogdan Diaconescu, Bojan Kovacevic, Boris Bumber, Boris Sakakushev, Boris Tadic, Bouhani Malek, Bourhan Alrayes, Bradley Thomas, Branislav Gális, Brendan Gallagher, Brett Knowles, Brian Cunningham, Brian Daley, Brijesh Mishra, Bruce Ashford, Brunella Maria Pirozzi, Bruno Berselli, Bruno Martinez-Leo, Bruno Sensi, Bruno Nardo, Burak Celik, Burak Giray, Burçin Abud, Bushray Almiqlash, C S Pramesh, Cagatay Taskiran, Caio Antonio De Campos Prado, Calogero Cipolla, Calvin Kumar, Camilla English, Camilla Riccetti, Camilla Vanni, Camille Brasset, Candice Downey, Caoimhe Duffy, Carina Chwat, Carina Cutmore, Carl Sars, Carlo Ratto, Carlo Alberto Pacilio, Carlos De La Infiesta García , Carlos Guijarro Moreno, Carlos Magalhães, Carlos Prada, Carlos Shiraishi Zapata, Carlotta Senni, Carolina Dutra Queiroz Flumignan, Carolina Martinez-Perez, Carolina Lugo Duarte , Carolina Soledad Romero Garcia, Caroline Anderson, Caroline Hing, Carolyn Cullinane, Caterina Cina, Catheriner Zabkiewicz, Catrin Sohrabi, Cem Emir Guldogan , Cezar Ciubotaru, Chaitya Desai, Chandrajit Raut, Charis Demetriou, Charles Handford, Charles Okpani, Charudutt Paranjape, Cherry Koh, Chetan Khatri, Chetan Parmar, Chi Wei Mok, Chiara Caricato, Chiara Marafante, Chidiebere Peter Echieh, Chih Ying Tan, Chon Sum Ong, Christel Conso, Christiaan Jardinez, Christian Konrads, Christian Warner, Christian Chigozie Makwe, Christin Henein, Christina Fleming, Christina L Roland, Christine Maurus, Christine Nitschke, Christof Mittermair, Christoph Mallmann, Christophe Andro, Christopher Harmston, Christopher Kuppler, Christopher Lotz, Christopher Nahm, Christopher Rowe, Christopher Ryalino, Christopher Wallis, Christopher Paul Millward, Christos Anthoulakis, Christos Apostolou, Christos Chouliaras, Christos Kalfountzos, Christos Kaselas, Christos Vosinakis, Chukwuma Okereke, Chung Shen Chean, Ciaran Barlow, Cihad Tatar, Cillian Clancy, Cillian Forde, Claire Sharpin, Claire Mccarthy, Claire Nestor, Claire Warden, Clara Castro Ávila, Clara Massaguer, Clarissa Ern Hui Fang, Claudia Pinto Martins, Claudio Guerci, Claudio Mauriello, Clemens Holzmeister, Clemens Miller, Clemens Weber, Clemens Georg Wiesinger , Cleo Kenington, Colin Noel, Colin Sue-Chue-Lam, Collins Adumah, Colm Neary, Comert Sen, Conall Fitzgerald, Constantine Ezeme, Constantinos Nastos, Cristian Mesina, Cristina Bombardini, Cristina Torregrosa, Cristina Puentes Valdespino , Cristine Pathirannehalage Don, Dakshitha Wickramasinghe, Damiano Milanesi, Daniel Armijos, Daniel Asiimwe, Daniel Beswick, Daniel Clerc, Daniel Cox, Daniel Doherty, Daniel Fernández Martínez, Daniel Garay Lechuga, Daniel Gero, Daniel Gil-Sala, Daniel Lindegger, Daniel Reim, Daniel Shaerf, Daniel Shmukler, Daniela Branzan, Daniela Filipescu, Daniela Rega, Daniele Bernardi, Daniele Bissacco, Daniele Fusario, Daniele Morezzi, Danielle Sabella, Danijela Mrazovac Zimak, Danilo Vinci, Danjuma Sale, Danyal Zaman Khan, Dariel Thereska, Dario Andreotti, Dario Tartaglia, Darling Ramatu Abdulai, Dattatreya Mukherjee, Daunia Verdi, David Idowu, David John, David Johnson, David Moro-Valdezate, David Naumann, David Omar, David Proud, David Roberts, David Santos Guzmán, David Watson, David Julià Bergkvist, David Benjamin Lumenta, Davide Ferrari, Davide Rizzo, Dawit Degarege, Dayan Fanery Campino Castillo, Deborah Douglas, Deborah Wright, Deedar Nanjiani, Dejan Bratus, Demet Altun, Denise Sievers, Dennis Vaysburg, Devvrat Katechia, Dhruva Ghosh, Diallo Abdoul Azize, Diana Rodrigues, Diana Alejandra Pantoja Pachajoa, Dickon Hayne, Didier Mutter, Diego Raimondo, Diego Eskinazi, Diego Sasia, Diletta Corallino, Dillip Muduly, Dilraj Grewal, Dimitar Hadzhiev, Dimitra Peristeri, Dimitri Pournaras, Dimitri Aristotle Raptis, Dimitrios Angelou, Dimitrios Haidopoulos, Dimitrios Magouliotis, Dimitrios Moris, Dimitrios Schizas, Dimitrios Symeonidis, Dimitrios Tsironis, Dimitrios Korkolis, Dimitris Tatsis, Dinesh Thekkinkattil, Dirk Rolf Bulian, Diwakar Pandey, Dogan Vatansever, Dominic Parker, Dominik Wiedemann, Dominika Borselle, Domiziana Pedini, Donald Schweitzer, Donatas Venskutonis, Dr Job Otokwala, Dr Kabir Musa Adamu, Dr Parvathy Pk, Dr. Mebanshanbor Garod, Dr.amera Ali Dakheel Ellafi, Dragana Zivkovic, Drago Jelovac, Duminda Wijeysundera, Duncan Mcpherson, Éanna Ryan, Ebere Ugwu, Ebikela Ivie Baidoo , Ebrahim Shaddad, Ecem Memişoğlu, Eddy P. Lincango Naranjo, Edgar Brodkin, Edoardo Segalini, Edoardo Viglietta, Eduard Hendriks, Eduard-Alexandru Bonci, Eduarda Sá-Marta, Eduardo Nieto Ortega, Eduardo Garcia-Loarte Gomez, Edwaldo Edner Joviliano, Edward Clune, Edward Horwell, Edward Mains, Edward Vasarhelyi, Edward J Caruana, Edward J Nevins, Edwin Mwintiereh Ta-Ang Yenli, Efstratia Baili, Eftychios Lostoridis, Eghosa Morgan, Ehab Shiban, Ejaz Latif, Ekaterini Christina Tampaki, Ekene Ezenwa, Ekpemi Irune, Elaine Borg, Elamin Eisa, Eleftherios Gialamas, Elena Parvez, Elena Theophilidou, Elena Adelina Toma, Eleni Arnaoutoglou, Elgun Samadov, Elie Kantor, Elif Akbas Ulman, Elif Colak, Elisa Cassinotti, Elisa Bannone, Elise Sarjanoja, Elizabeth Yates, Elizabeth Vincent, Elizabeth Weng Yan Lun, Elmedina Cerovac, Elmes Saoussene Dif, Elmustafa Alkhalifa, Elorm Daketsey, Elsayed A. Fayad, Eman Sheikh , Emanuele Pontecorvi, Emanuele Cammarata, Emanuele La Corte, Emanuele Rausa, Emeka Danielson Odai, Emilia Guasch, Emiliano Cano-Trigueros, Emilie Uldry, Emilio Peña Ros, Emily Matthews, Emin Erhan Donmez, Emmanouil Giorgakis, Emmanouil Kapetanakis, Emmanouil Stamatakis, Emmanuel Bua, Emmanuel Schneck, Emmanuel Aadereyir Nachelleh, Emmanuel Owusu Ofori, Emrah Akin, Emre Gönüllü, Emre Furkan Kirkan , Enes Çelik, Enoch Wong, Enrico Capozzi, Enrico Pinotti, Enrique Colás-Ruiz, Enrique González , Enver Fekaj, Ephraim Ohazurike , Ephrem Kebede, Ergin Erginöz, Erik Efrain Sosa Duran, Erin Scott, Erman Aytac, Erminia Albanese, Ernes John Castro, Eslam Albayadi, Eslam Kriem, Esra Siddig, Esraa Otify, Essam Eldien Abuobaida Banaga Hag El Tayeb, Estelle How Hong, Esther Saguil, Etienne Belzile, Eugene Tuyishime, Eugenio Panieri, Eunate Ganuza Martínez, Eva Myriokefalitaki, Evan G. Wong, Evangelia Samara, Evans Kofi Agbeno, Evgeniy Drozdov, Evripidis Tokidis, Faaiz Ali Shah, Fabio Barra, Fabio Carbone, Fabio Ferreli, Fabio Marino, Fabio Martinelli, Fabrizio D'acapito, Fabrizio Masciello, Fabrizio Bàmbina , Fadi Issa, Fadi-Tamas Salameh, Fagnon Kethy , Fahad Mahmood, Fahed Gareb, Farah Idrees, Faramarz Karimian, Fariha Ashraf, Farnaz Haji, Farwa Inayat, Farzana Begum, Fatma Nabil, Fausto Rosa, Fayza Haider, Fazl Parray, Federica Calculli, Federica Ferracci, Federica Saraceno, Federico Coppola, Federico Coccolini, Federico Fusini, Federico Migliorelli, Felice Pecoraro, Felipe Alconchel, Felipe José Fernandez Coimbra, Felipe Trivik-Barrientos, Felix Naegele, Felwa Almarshad, Ferdinando Agresta, Fergal Fleming, Fernando Mendoza-Moreno, Filip Brzeszczyński , Filippo Carannante, Fiona Wu, Firas Aljanadi, Firdaus Hayati, Flaminia Campo, Flavia Sorbi, Flavio Milana, Flavio Roberto Takeda, Florence Shekleton, Florian Gessler, Florian Recker, Florin Grama, Floryn Cherbanyk, Folayemi Faponle, Fragkiskos Angelis, Francesca Calabretto, Francesca Gaino, Francesca Toia, Francesco Bianco, Francesco Bussu, Francesco Cammarata, Francesco Castagnini, Francesco Colombo, Francesco Ferrara, Francesco Fleres, Francesco Guerrera, Francesco Litta, Francesco Mongelli, Francesco Pata, Francesco Roscio, Francesk Mulita, Francisco Ardura, Francisco J Tejero-Pintor, Francisco Javier Redondo Calvo, Francisco Jose Barbosa Escobedo, Francisco José Barbosa Camacho, Franco Odicino, Françoise Schmitt, Frank Bloemers, Frank Hölzle, Frank Enoch Gyamfi, Franka Messner, Frederick Koh, Freud Cáceres, Freyja-Maria Smolle-Juettner, Frima Herman, Funbi Ayeni, Gabriel Djedovic, Gabriel Paiva De Oliveira, Gabriel Rodrigues, Gabriela Wagner, Gabriele Bellio, Gabriella Giarratano, Gabriella Teresa Capolupo, Gabrielle Budd, Gad Marom, Gaetano Poillucci, Gajendiran Thiruchandran, Gary Nicholson, Gary Groot, Gary Hoey, Gary Alan Bass, Gaurav Sachdev, Gaurav Agarwal, Gaurav Aggarwal, Gennaro Cormio, Gennaro Mazzarella, Gennaro Perrone, Georg Osterhoff, Georg Singer, George Dejeu, George Fowler, George Garas, George Gradinariu, George Theodoropoulos, George Tzimas, George Babis, George Kwok Chu Wong, George W V Cross, Georgia Micha, Georgios Chrysovitsiotis, Georgios Koukoulis, Georgios Peros, Georgios Tsoulfas, Georgios Kapetanios, Georgios Karagiannidis, Georgios-Ioannis Verras, Gerald Ekwen, Gerardo Perrotta, Gerardo Petruzzi, Giacomo Bertelli, Giacomo Calini, Giacomo Fiacchini, Giacomo Maria Pirola, Giampiero Dolci, Gian Mendiola, Gian Luca Baiocchi, Gian Marco Palini, Gian Marco Prucher, Giancarlo D'andrea, Giandomenico Maggiore, Gianluca Cassese, Gianluca Franceschini, Gianluca Pellino, Gianmarco Saponaro, Gianmaria Casoni Pattacini, Gianni Pantuso, Giannicola Iannella, Gilbert Batieka Bonsaana, Gillian Lever, Gioia Brachini, Giorgio Giraudo, Giorgio Lisi, Giorgio Ivan Russo, Giovanni Aprea, Giovanni Pascale, Giovanni Tomasicchio, Giovanni Battista Levi Sandri, Giulia Armatura, Giulia Turri, Giulia Zaccaria, Giuliano Barugola, Giuliano Lantone, Giulio Gasparini, Giulio Iacob, Giulio Sozzi, Giuseppa Zancana, Giuseppe Mercante, Giuseppe Bianco, Giuseppe Brisinda, Giuseppe Consorti, Giuseppe Currò, Giuseppe Giannaccare, Giuseppe Palomba, Giuseppe Pascarella, Giuseppe Rotunno, Giuseppe Spriano, Giuseppe Vizzielli, Giuseppe Cucinella, Giuseppe Sica, Giuseppina Campisi, Glauco Baiocchi, Glen R Guerra, Glenda Marina Falcon Pacheco, Gokhan Atis, Goran Augustin, Goran Šantak, Govind Singh Chauhan, Graham Branagan, Grant Harris, Grant D. Stewart, Greg Padmore, Gregor Jan Kocher, Gregorio Di Franco, Gregorio De Jesus Labrador Hernandez, Gregory Christodoulidis, Gregory Neal-Smith, Guang Yim, Guglielmo Niccolò Piozzi, Guillem Claret, Guillermo Yanowsky-Reyes, Guipson Dhaity Dhaity, M.d, Guldeniz Karadeniz Cakmak, Guleed Mohamed, Gultekin Ozan Kucuk, Guntis Ancans, Gurpreet Singh Banipal, Gustavo De Bacco Marangon, Gustavo Laporte, Gustavo Martinez-Mier, Gustavo Recinos, Gustavo Miguel Machain V, Guy Benshetrit , Guy Vijgen, Gwynedd Pickett, H. Alejandro Rodriguez, Haaris Shiwani, Habtamu Derilo, Hadeel Awad, Hadi El Assaad, Hadijat Olaide Raji, Hailey Hardgrave, Haluk Kerim Karakullukcu, Hameedat Opeyemi Abdussalam, Hamid Mustafa , Hammad Parwaiz, Hamza Khan , Hana Arbab, Hani Naga, Hani Salem, Hanife Seyda Ulgur, Hanna Perez-Chrzanowska, Hannah Greenlee, Hannah Javanmard-Emamghissi, Hans Lederhuber, Hany Osman, Harissou Adamou, Haroon Javaid Majid, Harry Van Goor, Harry Vm Spiers, Hassan Fatemi Manesh, Hassan Mushtaq, Hattan Aljaaly, Hayat Ben Hasan , Hayat Tarig Abdelhafiz Ahmed, Hector Martinez-Said, Héctor J Aguado, Heitor Consani, Helen Chaplin, Helen Mohan, Helen Van Vliet, Helmut Alfredo Segovia Lohse, Hemina Shah, Henry Claireaux, Herman Lule, Hernández Juara , Hesham Abozied, Heura Llaquet Bayo, Hidar Alibrahim, Hidde M Kroon, Hilmican Ulman, Hina Khan, Hiroshi Yonekura, Hisham Abou-Taleb , Ho Ying Flora Wong, Holly Carpenter, Hooman Soleymani Majd, Horácio Zenha, Horacio F. Mayer, Hosam Elghadban, Hossam Abdou, Hossam Elfeki, Hossein Yusefi, Hugo Gomez-Fernandez, Hugo Layard Horsfall, Hugo Meleiro, Hulya Sungurtekin, Humberto Fenner Lyra Junior, Husein Moloo, Hüseyin Bayhan, Hüsnü Şevi̇k, Hussein Embarek, Hytham K. S. Hamid, I.h.d Saman Pradeep, Ian Donkin, Ibabe Villalabeitia Ateca, Ibrahim Jafarov, Ibrahim Salisu, Ibrahim Abdalaal , Ibrahim Umar Garzali, Ibrahima Sall, Idowu Adebara, Ifeanyi Aghadi, Ifeanyichukwu Ugwu, Ignacio Zapardiel, Igor Reis, Ikechuwu Nwafor, Ildar Fakhradiyev, Ilham Utama Surya, Ilma Robo, Iloba Njokanma, Immacolata Iannone, Imran Khan, Inês Correia, Ingmar Königsrainer, Ingmar Seiwerth, Inmaculada Benítez Linero, Innih Kadiri, Ioan-Alexandru Florian, Ioanna Tzima, Ioanna Akrida, Ioannis Baloyiannis, Ioannis Gerogiannis, Ioannis Katsaros, Ioannis Tsakiridis, Ioannis Valioulis, Ionut Negoi, Ip Yadev, Irene De Haro Jorge, Irene Ortega Vázquez, Irida Dajti, Iris Shari Russo, Irrum Afzal, Isaac Wasserman, Isaac Chukwu , Isabel Gracia, Isabel Mora Oliver, Isabel Hughes, Isabella Mondi, Isaie Ncogoza, Isam Bsisu, Isbah Rashid, Ishwarya Balasubramanian, Islam Omar, Mb Bch, Msc, Mrcs, Febs/Gensurg, Ismael Dominguez-Rosado, Ismail Smati, Ismail Vokshi, Ismail A. Al-Badawi, Ismail Ali Saleh, Isobel Pilkington, Iva Kirac, Ivan Trostchansky, Iwona Magdalena Gawron, Jacobo Trebol, Jacopo Martellucci, Jacopo Andreuccetti, Jad Abou-Khalil, Jaffer Shah, Jaiganesh Manickavasagam, Jaime Rodríguez De Alarcón, Jakov Mihanovic, James O'riordan, James Archer, James Ashcroft, James Blair, James Hamill, James Munthali, James Park, James Parry, James Ryan, James Tomlinson, James Wheeler, James Wilkins, James A. Balogun, James Michael Hodgetts, Jamie Vatish, Jan Žatecký, Jana Dziakova, Janet Martin, Jasmine Winter Beatty, Jasper Stijns, Javaria Faiz, Javier Ripollés-Melchor , Javier Mata, Javier Alberto Gutiérrez Vásquez, Jayanta Kumar Mitra, Jean Jacques Tuech, Jean Paul Mvukiyehe, Jean-Michel Fallah, Jeancarlos Trujillo Díaz, Jeewan Ram Vishnoi, Jef Van Den Eynde, Jennifer Rickard, Jens Rolinger, Jeremy Kaplowitz, Jeremy Meyer, Jeremy Reid, Jeremy Rossaak, Jeremy Smelt, Jerin Jose Thomas, Jeryl Anne Silvia Reyes, Jessica Davies, Jessica Luc, Jesús Aarón Martínez Alonso, Jiannis Hajiioannou, Jill Querney, Jill Van Acker, Jingya Jane Pu, Jitoko Cama, Joana Simoes, Joanne Cozens, Joao Barbosa-Breda, João Ribeiro, Joaquin De Haro, Joe Nigh, Joel Bowen, Joerg Matthias Pollok, Johanna Josefine Strotmann, Johannes Doerner, John Edwards, John Green, John Massoud, John Mcgrath, John Squiers, John Street, John Windsor, John Ashutosh Santoshi, John G. Meara, John Tabiri Abebrese, John-Joe Reilly, Jon Zabaleta, Jonathan Phillips, Jonathan Herron, Jonathan Horsnell, Jonathon Dawson, Jonathon Sheen, Joonas H Kauppila, Joop Konsten, Jordi Raurich-Leandro, Jorge Sanz Romera, Jorge Nuñez, Jörn-Markus Gass, Jose Blanco, Jose Andres Calvache, Jose Luis Fadil Iturralde, José Luis D'addino, Jose María González Hermosa, Jose Ramon Oliver Guillen, Jose-Luis Beristain-Hernandez, Josep M Sole-Sedeno, Josep Maria Muñoz Vives, Joseph Attwood, Joseph Furey, Joseph Hadaya, Joseph Mckay, Joseph Meilak, Joseph Natale, Joseph Shalhoub, Josephine Jung, Joshua Arthur, Joshua Kealey, Joshua Wright, Joshua Moreau, Josip Miskovic, Jovan Juloski, Juan Carlos Catalá Bauset, Juan José Segura-Sampedro, Juan Roberto Torres Cisneros , Juan-Carlos Gomez-Rosado, Jugpal Arneja, Julia Heider, Julio Domenech Fernández, Julio Plata-Bello, Julio Villanueva, Julius Olaogun, Jun Xian Hing, Jurij Aleš Košir, Jurstine Daruwalla, Justin Yeung, Justin Wormald, Justina Seyi-Olajide, Jyotsna Rani, Kai Yuen Wong, Kalina Hristova, Kamal Kajal, Kamal Algarni , Kanthan Theivendran, Kaori Futaba, Karam Elsayem, Karan Kapur, Karen Bailey, Kariem El-Boghdadly, Karim Ataya, Karisha Lacorbiniere, Karishma Shah, Karla Susana Martin Tellez, Karol Szyluk, Karthick Rangasamy, Karthikeyan Iyengar, Katarína Szabómihályová, Kate Atkinson, Katherin Camargo-Parra, Katherine Galliard, Kathryn Dickson, Kathryn Singh, Kawthar Qader, Kawthar Hasan, Kayleigh Spellar, Kaylem Feeney, Kayode Ajenifuja, Ke En Oh, Kehinde Okunade, Kekeli Adanu, Kellie Bateman, Kemal Saracoglu, Ken Weixing Ho, Kenneth Enwerem, Keshav Mishra, Kevin Verhoeff, Khadidja Bensoltane, Khadidja Larabi , Khairul Hazim Hamdan, Khaldoun Nadi, Khaldoun Fozo, Khaled Abdelwahab, Khaled Al-Sayaghi, Khaled Dajani, Khaled Algahtany, Khalid Abdel-Galil, Khalid Ahmed, Khalid Bajunaid, Khalid Bhatti, Khalid Sofi, Khalifa Abdulsalam, Khalil Tamoos, Khasan Dzhumabaev, Khursheed Ahmed Samo, Kieran Purich, Kiran Madhvani, Kirby R. Qin, Kirk Underwood, Kithsiri Janakantha Senanayake, Knut Magne Augestad, Kohila Sigamoney, Konstantinos Apostolou, Konstantinos Bouchagier, Konstantinos Bouliaris, Konstantinos Bramis, Konstantinos Gousias, Konstantinos Lasithiotakis , Konstantinos Paraskevopoulos, Konstantinos Perivoliotis, Konstantinos Roditis, Konstantinos Stamatis, Konstantinos Stroumpoulis, Kosmas I. Paraskevas, Krishna Kumar Govindarajan, Kristián Šimko, Kristofor A. Olson, Krunal Khobragade, Kt Matthew Seah, Kunal Kishore, Kusay Ayad, Kyriakos Papavasiliou, Kyveli Angelou, Ladislao Cayetano Paniagua, Ladislav Czako, Laine Valerie Kongsun Ching, Lajpat Rai, Lalit Gupta, Lamiese Ismail, Langanani Mbodi, Lanka Dasanayake, Lars Schröder, Lateef Ayodele Baiyewu, Laura Fortuna, Laura Gomez Fernandez, Laura Guillamon Vivancos, Laura Jack, Laura Keçi, Laura Lavalle, Laura Leonard, Lauren Shelmerdine, Lauretta Vaassen , Layla Hasan, Lazaros Lazarou, Lazaros Tzelves, Leandro Matos, Leandro Siragusa, Leo Licari, Leonardo Santos Lima, Leonardo Solaini, Leonid Lichman, Leopoldo Tapia Moral, Leticia Cabeza , Lewis Kaplan, Liana Valeanu, Lileswar Kaman, Lina Karout, Linas Pieteris, Linda Chan, Linda Grüßer, Lindsey Zamora, Lisa Catarzi, Lisa Rampersad, Lofty-John Anyanwu, Lok Ka Cheung, Lorena Varela Rodríguez, Lorenzo Andreani, Lorenzo Cobianchi, Lorenzo Petagna, Louise Howse, Lourdes Elorduy Gonzalez, Lovenish Bains, Lubna Vohra, Luca Ansaloni, Luca Bertolaccini, Luca Ferrario, Luca Orecchia, Luca Tirloni, Luca Zanin, Luca Morelli, Luca Scaravilli, Luca Giovanni Locatello, Lucia Diego García, Lucian Vida, Ludovico Carbone, Ludwig Maximilian Heindl, Luigi Bonavina, Luigi Conti, Luigi Marano, Luigi Verre, Luigi Eduardo Conte, Luis Boccalatte, Luis Garcia-Sancho Tellez, Luis Loureiro, Luis Sánchez-Guillén, Luis Tallon-Aguilar, Luis Nakano, Luis Adrian Alvarez-Lozada, Luis Angel Suarez Gonzalez, Luis Joaquín García Flórez, Luis-Cristobal Capitan-Morales, Luiz Paulo Kowalski, Lukas Werner Widmer, Luke Harper, Luke Render, Luke Wheldon, Lukman Abdur-Rahman, Lütfi Doğan, Lydia Prusty, Lykoyrgos Katsiaras, Lysander Gourbault, M. Tayyab Siddiqui, Ma'moun Saleh, Madhivanan Karthigeyan, Magdiel Rodriguez, Mahbub Chowdhury, Mahesh Nagappa, Mahesh Sultania, Mahmod Bashir, Mahmood Alam, Mahmoud Abdelaziz Mohamed Elshahawy, Mahmoud Elfiky, Mahmoud Loubani, Mahmoud Marei, Mahmoud Mewafy, Mahmoud Alali, Mahmoud A Nassar, Majd Alobied, Majed Bilfaqirah, Maleeha Ahmad, Malena Rius, Mallikarjuna Manangi, Mamun David Dornseifer, Manjul Tripathi, Manjula S, Manol Sokolov, Manon Pigeolet, Manuel Diez Alonso, Manuel Losada, Manuel Moriche Carretero, Manuel Tousidonis, Manuel Damasio Cotovio, Manuk Wijeyaratne, Mar Achalandabaso Boira, Mara Franza, Maram Albdour, Maram Alkhatieb, Marc Danguy Des Déserts, Marc Niewiera, Marc Vallve-Bernal, Marcel Marjanović Kavanagh, Marcello Migliore, Marcello Calabrò, Marcello Di Martino, Marcello Reicher, Marco Baia, Marco Caricato, Marco Clementi, Marco De Zuanni, Marco Fiore, Marco Giacometti, Marco Inama, Marco Maestri, Marco Materazzo, Marco Sparavigna, Marco Maria Pascale, Marcus Nemeth, Margherita Serra, Margo Medhat Fouad Fahim, Maria Coronas Soucheiron, Maria Papadoliopoulou, Maria Wittmann, Maria Sotiropoulou, María García-Conde, Maria Chiara Ranucci, María Dolores Arribas Del Amo, Maria Jesus Maroño Boedo, Maria Jose Martinez Velázquez , Maria Katerina Pissaridou, Maria Laura Petersen, Maria Luís Sacras, Maria Marta Modolo, Maria Mercedes Caubet, Maria Michela Di Nuzzo, Maria P Ntalouka, Maria Paola Menna, Maria-Lorena Aguilera-Arevalo, Mariam Rela, Marianna Capuano, Marianne Hollyman, Maricarmen Olivos, Marie Dione Sacdalan, Marie-Claire Raphael, Marijn Takkenberg, Marina Bortul, Marino Cabrera, Mario Castaño, Mario D'oria, Mario Giuffrida, Mario Mella Laborde, Mario Rodriguez-Lopez, Mario Trejo-Avila, Mario Virgilio Papa, Marios Ghobrial, Marius Kryzauskas, Mariyah Anwer, Mark Cheetham, Mark Davies, Mark Higgins, Mark Siboe, Marko Tarle, Markus Velten, Markus Wurm, Marlen Süleyman, Marlies Bauer, Marliza O’dwyer, Marta Caretto, Marta De La Rosa-Estadella, Marta Fragoso, Marta Lopes Serra, Marta Merayo, Marta Roldón Golet, Marta Isabel Martínez-Sánchez, Marta María Arroyo Domingo, Martijn Gosselink, Martin Batstone, Martin Reichert, Martin Salö, Martina Soljic, Martina Zambon, Martina Aida Angeles, Marwa Abdulkhaleq, Maryam Abdelkarim, Maryam Alsefri , Masae Iwasaki, Masaki Shiota, Massimiliano Veroux, Matilde Molina-Corbacho, Matteo Frasson, Matteo Serenari, Matteo De Pastena, Matteo Desio, Matteo Risaliti, Matteo Rottoli, Matthew Bence, Matthew Chan, Matthew Watson, Matthew Wiles, Matthieu Boisson, Mattia Berselli, Mattia Capobianco, Mattia Di Bartolomeo, Matyas Fehervari, Maurizio Pacilli, Maurizio Romano, Maurizio Zizzo, Maurizio Domanin, Mauro Montuori, Mauro Podda, Mauro Zago, Mawutor Dzogbefia, Maximos Frountzas, May Htoo Thaw, Maytham Al-Juaifari , Mayur Gharat, Mazin Mohamed , Md. Jafrul Hannan, Meenakshi Venketeswaran, Meer Chisthi, Megbar Dessalegn, Mehmet Kaplan, Mehmet Çağlar Çakıcı, Mehmet Eşref Ulutaş, Mekki Hassan, Menan Elsadek , Mengistu G Mengesha, Mercedes Estaire Gómez, Merihan A. Elbadawy, Meron Pitcher, Mert Tanal, Merve Tokocin, Merve Ergenç, Meryem Nur Çelik, Metaxia Bareka, Mevlut Recep Pekcici, Micaela Cappuccio, Michael Dasa, Michael Dewan, Michael El Boghdady, Michael Ezeanochie, Michael Greenhalgh, Michael Jenkinson, Michael Kelly, Michael Spartalis, Michael Zyskowski, Michaël Racine, Michael De Cillia , Michael Jen Jie Chu, Michael R. Mallmann, Michael Z.l. Zhu, Michail Klimovskij, Michail Vailas, Michał Kisielewski, Michel Adamina, Michela Campanelli, Michele Carvello, Michele Ammendola, Michele Manigrasso, Michele Scopelliti, Michelle White, Michelle L Collins, Mickael Chevallay, Miguel Fróis Borges, Miguel Mayo-Yáñez, Miguel Rocha Melo, Miguel Ruiz-Marín, Miguel Angel Freiria Eiras, Miguel F. Cunha, Mihaela Pertea, Mihail Slavchev, Mihnea Davidescu, Mikel Prieto, Mikhail Agapov, Milad Gahwagi, Milagros Carrasco Prats, Milan Rudic, Milena Senica Verbic, Milosz Kostusiak, Mircea Gabriel Stoleriu, Miriam Abellan Lucas, Mirko Barone, Misbahu Ahmad, Misganaw Alemu Adimass Alemu, Mishal Fatima, Mitsuru Ida, Mo Sahu, Mo'nes Muhaisen, Moacyr Salem, Moataz Maher Emara, Mobolaji Oludara, Mohadeseh Sotudeh, Mohamad B. Kassab, Mohamed Abdelkhalek, Mohamed Alsori, Mohamed Anwar, Mohamed El-Kassas, Mohamed Elbahnasawy, Mohamed Eldabaa, Mohamed Rabie, Mohamed Abdelghafor Hassanin, Mohamed Adhnan Thaha, Mohamed Shafi Mahboob Ali, Mohammad Alhamid, Mohammad Badr Almoshantaf, Mohammad Reza Keramati, Mohammed Bafaquh, Mohammed Abuzaid, Mohammed Al-Shehari, Mohammed Alharthi, Mohammed Alkahlan, Mohammed Alwash, Mohammed Alyousef, Mohammed Amir, Mohammed Basendowah, Mohammed Deputy, Mohammed Jibreel, Mohammed Shadrul Alam, Mohammed Alsharif , Mohammed Duah Issahalq , Mohammed Eltahier Abdalla Omer, Mohammed Kabir Abubakar, Mohd Rusdi Draman, Moheyaldien Ahmed Elamin Elnour, Momin Eltayeb, Monica Noguez Castillo, Monir Jawad, Monish Raut, Montassar Ghalleb, Morihiro Katsura, Moritz Lebe, Mostafa Abbas, Mostafa Abdelrahman, Mostafa Shalaby, Muhamed Farhan-Alanie, Muhammad Farooq, Muhammad Musadaq, Muhammad Arshad, Muhammad Ayyub Anjum, Muhammad Usman, Muhammad Amjad Chaudhary, Muhammad Asif Raza, Muhammad Fairuz Shah Abd Karim, Muhammad Hamid Chaudhary, Muhammad Haris Janjua, Muhammad Imran Khokhar, Muhammad Isfandyar Khan Malik, Muhammad Taqi Pirzada, Muhammad Umar Younis, Muhammed Elhadi, Muhammed Salih Suer, Muhammer Ergenç, Muhannud Binnawara , Muhawenimana Emmanuel, Mujeeb Abbasi, Mukhammad David Naimzada, Mukhtar Kulimbet, Munenori Kusunoki, Muneza Eugene, Munish Chauhan, Muntaser Abu Shokor, Murad Aljiffry, Murat Kalın, Musbahu Kurawa, Müserref Beril Dincer, Musliu Adetola Tolani, Mustafa Soytas, Mustapha Yakubu, Mustapha Ibrahim Usman , Muyiwa Aremu, Mykola Paranyak, Nabila Talat, Nabila Kausar, Nagendra Dudi-Venkata, Nagham Bazzi, Najat Ben Hasan, Naomi Natasha Van Wyk, Naseebah Shaban, Naser Almgla, Naser Yousefzadeh Kandevani, Nasser Alzerwi, Natalia Alvarez, Natalia Motas, Natalia Andrea Rivera Rincón , Natalie Blencowe, Natalie Simon, Natasha Aghtarafi, Navdeep Kaur Ghuman, Naveen Sharma, Naveen Wijekoon, Navin Kumar, Naya Hassan, Ndubuisi Onyemaechi , Nebojša Prijović, Necdet Özçay, Neha Goel, Neil Segaren, Neil Sharma, Nektaria Kalyva, Nelson Morales Palacios, Nestor Fabian Pedraza Alonso, Ngozi Onyeagwara, Niccolò Petrucciani, Niccolo' Daddi, Nicholas Lightfoot, Nicholas Power, Nicholas Segaren, Nichole Starr, Nici Markus Dreger, Nicola Cillara, Nicola Colucci, Nicola Eardley, Nicola Tartaglia, Nicola Zanini, Nicolae Bacalbasa, Nicolas Campuzano, Nicolas Mouawad, Nicoletta Sveva Pipitone Federico, Nicolò Tamini, Nicolò Maria Mariani, Nigel Beasley, Nii Armah Adu-Aryee, Nikita Burlov, Nikolaos Dimitrokallis, Nikolaos Gouvas, Nikolaos Machairas, Nikolaos Memos, Nikolaos Thomakos, Nikolaos Tsakiridis, Nikolaos Schizas, Nikolaus Börner, Nikoletta Theochari, Nina Al-Saadi, Nina Glass, Nir Horesh, Nissi Evelyn. R, Nitesh Gahlot, Nizar Ismail, Noof Aljirdabi , Noor Ul Huda Maria, Nora Trabulsi, Nouf Akeel, Nuno Borges, Nupur Moda, Nuria Villacé Redondo, Obed Ofori Nyarko, Octav Ginghina, Octavian Enciu, Oghenekevwe Okere, Okechukwu Hyginus Ekwunife, Oladeji Quadri, Olakayode Ogundoyin, Olga Tucker, Olga Mateo-Sierra, Olivier Azzis, Olufemi Ojewuyi, Olufemi Habeeb, Olufemi Idowu, Olumide Elebute, Oluseyi Agboola, Oluwaseun Ladipo-Ajayi, Oluwaseun Oyinloye, Oluwaseyi Adebola, Oluwayemisi Ekor, Oluwole Ogundoyin, Omar Salamanca, Omar Vergara-Fernandez, Omar Wafi, Omar Aladawi, Omar Mohammed Bahassan, Ömer Tammo, Omer Faruk Ozkan, Omolara Modupe Williams, Omotayo Salami, Opeyemi Akinajo, Orazbek Sakhov, Oreste Gallo, Oriol Martin Sole, Oronzo Milella, Osaid Alser, Osama Al Bettar, Osama Alomar, Osama Saeed Osman, Oseremen Aisuodionoe-Shadrach, Oshan Basnayake, Osman Bozbiyik, Owen Hodges, Owolabi Ojo, Özge Yanık, Özgecan Pırıl Zanbak Mutlu, Ozgur Kazan, Pablo Calavia, Pablo Rodríguez García , Pablo Vallés Urriza, Paloma Rodriguez Lopez, Panagiotis Christidis, Panagiotis Dorovinis, Panagiotis Kokoropoulos, Panagiotis Mourmouris, Panayiotis Papatheodorou, Pankaj Kumar Garg, Panna Patel, Panteleimon Vassiliu, Paola Campennì , Paola De Nardi, Paolo Bernante, Paolo Ubiali, Paolo Baroffio, Paolo Pizzini, Paolo Sapienza, Par Myrelid, Paraskevi Chatzikomnitsa, Paraskevi Tsiantoula, Parth Gada, Pasquale Avella, Pasquale Cianci, Patricia Romero, Patricia Serrano Méndez, Patricio Andrés Freile Pazmiño, Patrick Coughlin, Patrick Kirchweger, Patrick Pessaux, Patrick J Maguire, Patrizio Petrone, Paul Cullis, Paul Köglberger, Paul Marriott, Paul Nankivell, Paulo Santos-Costa, Paulo N. Martins, Pedram Panahi, Pedro Botelho, Pedro Teixeira, Pedro Escobar, Pedro José Gil Vázquez, Petar Gribnev, Peter Nolte, Peter Agbonrofo, Peter Bobak, Peter Choong, Peter Elbe, Peter Hutchinson, Peter Labib, Peter Paal, Peter Pockney, Peter Reemst, Peter Szatmary, Peter G Vaughan-Shaw, Philip Alexander, Philip Pucher, Philip Stather, Philipp Foessleitner, Philipp Winnand, Philipp Zehnder, Philippe Kruse, Philomena Alice Wawer Matos, Pierfrancesco Lapolla, Pierfranco Maria Cicerchia, Piergiorgio Solli, Pierpaolo Di Lascio, Pierre Zarif, Pierre-Olivier Champagne, Pietro Anoldo, Pietro Bertoglio, Pietro Fransvea, Pietro Familiari, Pietro Maria Lombardi, Piotr Tomasz Stogowski, Placido Bruzzaniti, Prashant Tripathi, Prashanth D'sa, Pravin Salunke, Pritik A Shah, Prof Prakash P Punjabi, Prokopis Christodoulou, Qusai Hamdan , Ra'fat Tawalbeh, Rabea Gadelkareem, Rabih Awad, Rachael Callcut, Rachael Clegg, Rachel Choron, Rachel Payne, Rachel Gefen, Radu Costea, Radu Drasovean, Radu Mihail Mirica, Raevin Ravindra, Rafael Torres Fajardo, Rafael Leite Nunes, Raffaele Aspide, Raffaele Lombardi, Raghavan Vidya, Rahma Elboraei , Rahmah Saaid, Rahul Ghodke, Rahul Gupta, Rahul Deo Sharma, Raimundas Lunevicius, Raja Kalayarasan, Rajashekar Mohan, Rajdeep Singh, Rajesh Sivaprakasam, Rajkumar Kottayasamy Seenivasagam, Rajkumar Rajendram, Raluca Bievel Radulescu, Raluca Goicea, Ramakrishnan Ayloor Seshadri, Ramazan Sarı, Ramesh Nataraja, Ramisha Aslam, Rania Abdelemam, Rashmit Shrestha, Rasiah Bharathan, Raul Pellini, Raul Guevara, Ravi Agarwal, Ravi Vissapragada, Rawan A.rahman Alharmi, Raza Sayyed, Rebecca Browning, Rebecca Critchley, Rebecca Mallick, Rehab Alarabi, Reinaldo Isaacs Beron, Reinhold Függer, Rema Othman, Rema Saad, Remedios Revilla Amores, Renan Carlo Colombari, Renata Curic Radivojević, Renato Patrone, René Novysedlák, René Manuel Palacios Huatuco, Reto Baertschiger, Rhea Liang, Rhys Luckwell, Ricardo Escrevente, Ricardo Fernandes Rezende, Ricardo Pedrini Cruz, Riccardo Lenzi, Riccardo Rosati, Richard Donovan, Richard Egan, Richard Morris, Richard Page, Richard Seglenieks, Richard Unsworth, Richard Wilkin, Richard Je Skipworth, Richard Justin Davies, Rifat Bezirci, Rishi Talwar, Rizwan Azami, Rob Bohmer, Robert Crichton, Robert Fruscio, Robert Hooker, Robert Jach, Robert Parker, Robert Pillerstorff, Robert Sinnerton, Robert Stabler, Robert Michael O'connell, Roberta Ragozzino, Roberta Tutino, Roberta Angelico, Roberto Cammarata, Roberto Colasanti, Roberto Macchiavello , Roberto Peltrini, Roberto Pirrello, Roberto Vaschetti, Robinson Esteves Pires, Rocco Papalia, Rodrigo Arrangoiz, Roel Hompes, Rohin Mittal, Rokeya Salah, Romina Pinto , Ronald Flumignan, Rory Callan, Rory Cuthbert, Rory Dennis, Rosa Scaramuzzo, Rosa Montero Macías, Rosa Sánchez, Rosemary Ogu, Rosnelifaizur Ramely, Rossella Sgarzani, Roszalina Ramli, Roxane Hillier, Ruben Thumbadoo, Rucira Ooi, Rukiyat Abdus-Salam, Ruqaya Masri, Russell Hodgson, Ryan Mathew, Ryckie Wade, Sabatino D'archi, Sabina Khan, Sabrina Ngaserin, Sachin Kale, Sadiq Hassan, Safa Merghani , Safia Benamar , Sagir Muhammad, Saif Badran, Saifaleslam Elsahli, Saimir Heta, Salah Hammouche, Saleh Baeesa, Salvatore Paiella, Samaher Taj Eldeen Hassan Taj Eldeen , Samara Arkani, Samarth Mittal, Sameer Hirji, Sameer Tebha, Sameh Emile, Samer Dbouk, Samik Kumar Bandyopadhyay, Saminu Muhammad, Samson Olori, Samuel Amoako Asirifi, Samuel Hailu, Samuel Ling, Samuel Newman, Samuel Ross, Samuel Wanjara, Sandip Kumar, Sanjeewa Seneviratne, Sara Tamburello, Sara Busto Suarez, Sara Ingallinella, Sara Irshaidat , Sara Konswa, Sara Mambrilla, Sara Nasser, Sara Parini, Sara Pitoni, Sara Ornaghi, Sara Castanheira Rodrigues, Sarah Abdelmohsen, Sarah Aitken, Sarah Tian, Sarit Badiani, Sarwat Ahmad, Sarya Swed, Sathish Muthu, Sathya Lakpriya, Saud Alzahrani, Saulius Mikalauskas, Savita Lasrado, Savni Satoskar, Sayesha Bawa, Saygin Altiner, Sean Garcia, Sean Stevens, Sebahattin Demir , Sebastian Ken-Amoah, Sebastian Tranca, Sebastian Ziemann, Selmy Awad, Semra Demirli Atici, Sentilnathan Subramaniam, Serap Erel, Serena Jiang, Sergey Efetov, Sergey Efremov, Sergey Katorkin, Sergio Chávez Valladares, Sergio Marcos Contreras, Serhat Meriç, Serkan Zenger, Seyer Safi, Sezai Leventoğlu, Shady Elsalhawy, Shafaque Shaikh, Shahila Sheik, Shahnoor Islam, Shahzad Shamim, Shahzad Hussain Waqar, Shahzaib Ahmad, Shahzaib Farid, Shaikh Sanjid Seraj, Shalini Sundarraju, Sharad Karandikar, Sharan Sambhwani, Sharat Chopra, Sharfuddin Chowdhury, Sharon Laura, Sharwany Ahmed, Shaun Wason, Shawn Jia Hwang Tan, Sheila Fraser, Shekinah Williams , Sherief Ghozy, Sherif Abdelmawgoud, Sherif Shehata, Shilpa Sharma, Shima Ahmed , Shimaa A. Al-Touny, Shireen Ramzanali, Shireen Anne Nah, Shirley Jansen, Shiv Rajan, Shiva Dindyal, Shivang Amin, Shoaib Ahmad, Shoukrie I M Shoukrie, Shoura Karar, Shraddha Patkar, Shuaib Abdulsalam, Shuxun Lin, Siddhi Hegde, Silvia Fiorelli, Silvia Quaresima, Silvia Villacé Redondo, Silvia Palmisano, Silvia Ruggiero, Simon Balogun, Simon Cais, Simon Cole, Simon Federer, Simon Le Roux, Simona Ippoliti, Simona Meneghini, Simona Viola, Simone Manfredelli, Simone Novello, Sivakumar Gananadha, Smain Nabil Mesli, Smruti Kale, Sobhana Iftekhar Tani, Sobia Malik , Sofia Anastasiadou, Sofia Boligo, Sofia Esposito, Sofia Valanci, Sofia Xenaki, Sofija Pejkova, Soham Bandyopadhyay, Sokol Trungu, Somprakas Basu, Sondos Alkhatib, Sonia Pérez-Bertólez, Sonia Lopez Flores , Sophie Donoghue, Sorinel Lunca, Soyombo Orsoo, Spyridon Potamianos, Sreekar Devarakonda, Sreelakshmi Suresh, Stefanie M Croghan, Stefano Turi, Stefano Capella, Stefano Lucchini, Stefano Magnone, Stefano Salizzoni, Stefano Scabini, Stefano Scaringi, Stefano Piero Bernardo Cioffi, Steffen Seyfried, Stephan Degener, Stephanie Potten, Stephanie Taha-Mehlitz, Stephen Ali, Stephen Angamuthu, Stephen Mcaleer, Stephen Richard Knight, Stuart White, Styliani Mantziari, Stylianos Kykalos, Su Kah Goh, Subhadip Pal Chowdhury , Sufyan Ibrahim, Suha Elzwai, Sujesh Bansal, Sujit Tripathy, Sultan Amrayev, Sumadi Lukman Anwar, Sumit Banerjee, Sumit Thakar, Summaya Saeed, Sunil Kumar Venkatappa, Sunit Das, Suphakarn Techapongsatorn, Surya Kumar Dube, Susan Lee, Susana González-Suárez, Susana Henriques, Suzana Konjevoda, Suzanne Gisbertz, Sybil Lizanne Bravo, Syed Mannan, Syed Imran Bukhari, Syed Nabeel Zafar, Sylvia Batista, Synn Lynn Chin, Tahera Arif, Taiwo Akeem Lawal, Talar Vartanoglu Aktokmakyan, Tamara Osborn, Tamas Szakmany, Tamás Sztipits, Tania Triantafyllou, Tania Abigail Cueto Valadez, Tanveer Singh, Tanwir Khaliq, Tapan Patel, Tarig Fadalla, Tarik Jichi, Tarik Sammour, Tariq Al-Shaiji, Taryn Naggs, Tatjana Barišić, Taxiarchis Nikolouzakis, Tayfun Bisgin, Teresa Perra, Tevfik Kıvılcım Uprak, Themistoklis Dagklis, Theodore Liakakos , Theodoros Sidiropoulos, Theophilus Justus Kofi Adjeso, Theresa Dölker, Thida Oung, Thomas Aherne, Thomas Diehl, Thomas Pinkney, Thomas Raymond, Thomas Rhomberg, Thomas Schmitz-Rixen, Thumuluru Kavitha Madhuri, Tibor Karl Lohmann, Tien Yeoh, Tilemachos Zaimis, Tim Bright, Tim O. Vilz, Tim R. Glowka, Timothy Board, Timothy Hardcastle, Tina Cohnert, Tina Tomić Mahečić, Tinka George William, Tobias Klatte, Tom Abbott, Tom Watcyn-Jones, Tome Mendes, Tomislav Kulis, Tomislav Sečan, Tommaso Campagnaro, Tommaso Frisoni, Tommaso Simoncini, Tommaso Violante, Toms Janis Safranovs, Toni Risteski, Tony Pang, Tosin Akinyemi, Tsanko Yotsov, Tsegazeab Laeke, Tsukasa Kochiyama, Tunde T. Sholadoye, Tural Alekberli, Uchechukwu Ezomike, Ugo Giustizieri, Ugo Grossi, Ülkü Ceren Köksoy, Ulrich Bork, Ulrich Kisser, Ulrich Ronellenfitsch, Umar Saeed, Umberto Bracale, Umesh Jayarajah, Umme Habiba Abdul Rauf, Uros Bumbasirevic, Ursula María Jariod Ferrer, Usama Ahmed, Usman Mohammed Bello, Uzair Jogiat, Uzma Sadia, Vagif Galandarov, Vairavan Narayanan, Valentin Calu, Valentina Bianchi, Valeria Ciniero, Valeria Tonini, Vania Silvestri, Vardhini Vijay, Varun Dewan, Varut Lohsiriwat, Vasanthika Thuduvage, Vasileios Mousafeiris, Vedran Dragisic, Veerasamy Sasireka, Veljko Santric, Venkata Ramana Murthy Kusuma, Venkata Satish Kolli, Veronica Alonso, Veronica De Simone, Veronica Picotti, Verónica Martín Martínez, Vicky Panduro-Correa, Victor Kakotkin, Victor Pinto Angulo, Victor Turrado-Rodriguez, Vijay Krishnamoorthy, Vin Shen Ban, Vinay Shah, Vincenza Maiola, Vincenzo Giordano, Vincenzo La Vaccara, Vincenzo Lizzi, Vincenzo Papagni, Vincenzo Schiavone, Vinojan Satchithanantham, Virginia Garcia-Virto, Virginia Jimenez, Vishal Kumar, Vishal Shelat, Vivek Bhat, Vivek Sodhai, Vivien Graziadei, Vladislav Kutuzov, Vladislav Stoyanov, Vlasios Oktseloglou, Vojko Flis, Wael Atif Fadl Elhassan, Wah Yang, Wai Cheong Soon, Wail Tashkandi, Waleed Al-Khyatt, Waleed Mabood, Walid Bijou, Wasantha Wijenayake, Wasim D, Wiktor Krawczyk, William Atkins, William Bolton, William White, Wim Ceelen, Xanthoula Vagena, Yaacov Gozal, Yabasin Iddrisu Baba, Yamini Subramani, Yanina Jansen, Yash Mittal, Yasi̇n Kara, Yasir Zwain , Yasser Noureldin, Yazan Alawneh, Yener Aydin, Yick Ho Lam, Yita Tang, Yizhe Lim, Yomna Dean, Yousef Tanas, Yu-Xiong Su, Yuki Fujimoto, Yuksel Altinel, Yulia Frolova, Yusuf Oshodi, Zahir T Fadel, Zahra Zahid , Zain Elahi, Zakarya Djama, Zakia Zaheen, Zaynab Jawad, Zaza Demetrashvili, Zersenay Gebremeskel, Zewdie Gudisa, Ziyad Alyami, Zoe Garoufalia, Zoe Li, Zoran Zimak, Zorana Radin, Zsolt J. Balogh.