

Introduction



Global healthcare is a major contributor to the climate crisis



2019 report: “if the global health sector was a country, it would be the 5th largest emitter on the planet”



The NHS generates emissions equivalent to 4% of England’s carbon footprint

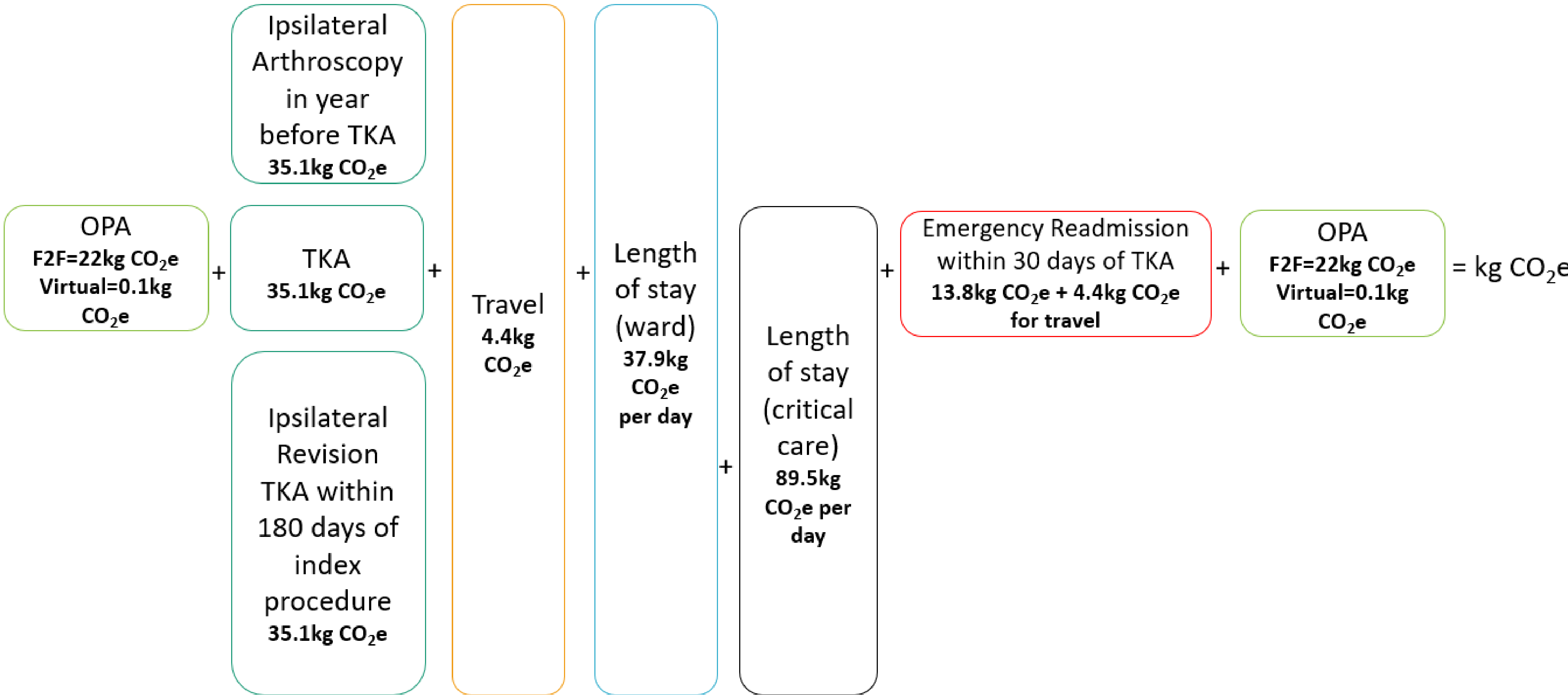
Aims

- Estimate the potential reduction in carbon emission as a result of changing trends in the care of patients in England undergoing TKA and how these link to patient outcomes.
- Secondary aim to estimate the potential carbon savings if changes made across all providers in England.

Method

- Retrospective analysis of Hospital Episodes Statistics (HES) database
- Patients ≥17 years old undergoing primary elective TKA between 01/04/2013 and 31/03/2022
- Calculation of the carbon footprint of an idealised TKA surgical pathway using Greener NHS and Sustainable Healthcare Coalition values

Carbon Footprint Calculation



Financial year	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22
Number of patients	74,705	79,136	80,693	84,767	79,701	81,504	78,987	26,018	63,350
Median days of index stay (IQR)	4 (3 to 5)	4 (3 to 5)	4 (3 to 5)	3 (3 to 5)	3 (3 to 4)	3 (2 to 4)	3 (2 to 4)	3 (2 to 3)	3 (2 to 3)
Critical care admissions during index stay	1,158 (1.6%)	1,199 (1.5%)	1,366 (1.7%)	1,361 (1.6%)	931 (1.2%)	1,241 (1.5%)	1,015 (1.3%)	273 (1.0%)	782 (1.2%)
Emergency readmission within 30 days	2,823 (3.8%)	2,924 (3.7%)	2,799 (3.5%)	2,885 (3.4%)	2,616 (3.3%)	2,805 (3.4%)	2,717 (3.4%)	770 (3.0%)	1,980 (3.1%)
Deaths within 180 days	318 (0.4%)	326 (0.4%)	336 (0.4%)	332 (0.4%)	305 (0.4%)	338 (0.4%)	346 (0.4%)	127 (0.5%)	245 (0.4%)
Revisions within 180 days	328 (0.4%)	311 (0.4%)	302 (0.4%)	322 (0.4%)	257 (0.3%)	271 (0.3%)	187 (0.2%)	59 (0.2%)	188 (0.3%)
Arthroscopies in year prior to index surgery	4,424 (5.9%)	4,039 (5.1%)	3,522 (4.4%)	2,848 (3.4%)	2,065 (2.6%)	1,412 (1.7%)	985 (1.2%)	169 (0.6%)	293 (0.5%)
Median number of face-to-face orthopaedic out-patient attendances in year prior to surgery (IQR)	3 (2 to 4)	3 (2 to 4)	3 (2 to 4)	3 (2 to 4)	3 (2 to 4)	3 (2 to 4)	3 (2 to 5)	3 (1 to 4)	3 (1 to 4)
Median number of face-to-face orthopaedic out-patient attendances in year post surgery (IQR)	3 (2 to 4)	2 (2 to 4)	2 (1 to 4)	2 (1 to 4)	2 (1 to 4)	2 (1 to 4)	2 (1 to 3)	2 (1 to 4)	2 (1 to 4)
Total carbon footprint per patient (kgCO ₂ e)	378.8	369.8	363.5	353.8	346	341.4	321.3	292.3	295.2

Results

- Reduction in LOS, emergency readmissions, revisions, pre-TKA arthroscopies have contributed to reduced patient carbon footprint
- If all years in the study had had the same carbon footprint per patient as 2021/22, a cumulative saving of **32,427,965.8 kg CO₂e** would have been made over the study period.
- That is equivalent to powering **29,509** homes in the UK with electricity for one year!

Discussion

- Reducing length of stay and pre-TKA arthroscopy did not result in any increase in adverse patient outcomes.
- Reducing length of stay had the biggest impact on the reduction of the carbon footprint over time.
- Further analysis of the TKA pathway is required to enable more accurate values for the carbon emissions involved in each step.
- This study has demonstrated a substantial reduction in per-patient carbon emissions as a result of changing practice associated with TKA.
- Carbon efficient pathways are a step to helping the NHS achieve its Net Zero target.
- Further reductions in length of stay and face to face follow up appointments are areas that could also contribute to a lower carbon footprint for the TKA pathway.