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REVIEW ARTICLE

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The impact of strike action on healthcare delivery: A scoping review

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Abstract

Background: Strike action carried out by healthcare workers raises a range of ethical issues. Most fundamentally, as a strike is designed to disrupt, it has the potential to impact patient outcomes and healthcare delivery. This paper synthesises and analyses the empirical literature that details the impact of strike action on healthcare delivery.

Methods: A systematic scoping review was utilised to examine the extent, range and nature of research activity. Embase, Medline, CINAHL, Bioethicsline, EconLit and Web of Science were searched, yielding 5644 results. Papers were included if they examined the impact that strike action had on healthcare delivery (i.e., admissions, presentations, waiting time). After screening, 43 papers met inclusion criteria.

Results: Nineteen studies explored presentations to emergency or admissions to hospital. Both dropped dramatically when comparing non-strike to strike periods. Ten studies examined length of stay in hospital and waiting times. No clear relationship was found with strike action, with some studies showing that wait times decreased. Nine studies examined the impact of strike action in facilities that were not on strike, but were impacted by nearby strike action along with the impact that strike action had on treatment seeking. Hospitals dealing with these upstream impacts

often saw increase in presentations at hospitals, but results relates to treatment seeking during strike action were mixed. **Conclusion:** Strike action can have a substantial impact on the delivery of healthcare, but this impact is not felt uniformly across services. While many services are disrupted, a number are not, with several studies reporting increased efficiency.

KEYWORDS
health, healthcare, protest, strike

Highlights

- Strike action has substantial impact on healthcare delivery.
- The impact that strike action has differs across services; this appears to be impacted by several factors, for example, the staff on strike.
- Facilities dealing with the fallout of nearby strike action faced significant increases in presentations. The literature was unclear whether patients change treatment seeking behaviour because of strike action.

1 | INTRODUCTION

Strike action carried out by healthcare workers has been a remarkably common phenomenon since the industrial revolution. It has only been recently that we have been able to quantify this. During the first year of the COVID-19 pandemic for example, globally there were 3913 instances of protest (the vast majority of which were strikes) carried out by healthcare workers.[1] Beyond being remarkably common, strike action occurs for a range of reasons; pay and conditions, concerns about patient safety and even because or broader issues, such as climate change, that lay outside the immediate workplace.[2] COVID-19 has only heightened these issues, with strikes and protest actions becoming more common.[3] Healthcare workers have protested inadequate personal protective equipment (PPE) and the handling of the pandemic more generally, there have also been strikes because of proposed vaccine mandates for healthcare workers.[4]

Strikes raise a range of ethical issues, related to patient care and perhaps most fundamentally, what healthcare workers and society owe one another when it comes to healthcare.[5] Most fundamentally, as a strike is generally designed to disrupt healthcare delivery, it has the potential to impact healthcare delivery and patient outcomes. The impact and justification of strike action has been debated for several decades, with passionate positions advanced both for and against strike action. Overwhelmingly arguments both for and against have focussed on patient mortality and other outcomes.[5] Two recent systematic reviews have shed some light on these debates, with both indicating that strike action had little impact on in-hospital patient morbidity[6] and in-hospital and population mortality.[7] These studies alone however paint a somewhat limited picture. In addition to being limited by the overall quality of evidence available, these reviews did not consider the impact that strike action has on the delivery of healthcare services. Understanding the impact that strike action has on the delivery of healthcare is important for several reasons, not only as it relates to the justification of strike action but also in its own right, in understanding the impact that such action may have on patient care and outcomes.

1.1 | New contribution

This review is the first to our knowledge that has synthesised and analysed the impact that strike action has on the delivery of healthcare services. This paper will provide important insights the impact that strike action has on

healthcare services, along with contributing to important debates regarding the justifiability of strike action, providing a knowledge base for healthcare workers, managers and policy makers in planning and responding to strike action and the potential impact that this could have on healthcare delivery.

1.2 | Research aims

The overarching aim of this review was to synthesise and analyse the empirical literature that explores the impact of strike action on healthcare delivery. Specifically, this review sough to explore how strike action impacts healthcare utilisation (presentations and admissions), the delivery of healthcare (waiting time and length of stay), and other key services such as surgery and outpatient services. This review also sought to explore how strike action impacts surrounding services that deal with the upstream effects of strike action (that is, services in surrounding areas that were not on strike, but dealt with additional patients because of a nearby strike) and what the implications of this may be for patient safety, access to care and for healthcare workers considering strike action.

2 | MATERIALS AND METHODS

2.1 | Design

To explore the above questions we utilised a systematic scoping review. This type of review seeks to examine range and nature of the research in a given area and identify any gaps in the literature.[8] To do this we employed the following steps. (1) identifying an area of interest and research question, (2) conducting a systematic search, (3) extraction of data, (4) synthesis of data and write-up. This review identified qualitative, quantitative and mixed-methods studies in a single search and then integrated throughout the analysis and presentation of the paper.[9] Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) reporting guidelines were followed[10]

2.2 | Search strategy

A search was conducted on 17/12/21 by RE. The following electronic databases and time periods were searched: EMBASE (1980–2021), MEDLINE (1946–2021), CINAHL (1982–2021), BIOETHICSLINE (1972–1999), EconLit (1969–2021), WEB OF SCIENCE (1960–2021) (Databases were searched with no time restrictions. Some databases covered different periods of time; Bioethicsline for examples stopped indexing papers in 1999). Search terms were developed to capture the core concepts, related to the form of intervention we were interested in (e.g. strike action, industrial action) and the populations in question (e.g. doctors, nurses, healthcare professionals).

The final search terms were: strike OR "industrial action" OR "industrial dispute" OR "collective action" AND doctor OR physician OR clinician OR "medical practitioner" OR nurs* OR "health profession*" OR healthcare OR "health care" OR "pharmac*" OR "dentist" OR "midwi*" OR dieti* OR "occupational therap*" OR "paramed*" OR "physiotherap*" OR "radiograph*" OR "psycholog*" OR "health worker" OR "hospital".

2.3 | Search results and screening

The search returned 5644 results across all databases. These were imported into Endnote where duplicates were removed, leaving 4240 articles. After the initial abstract screen (carried out by RE and SMW), 414 articles remained and a second detailed screen was undertaken and reference lists were searched. A further four papers were found and all 420 articles were assessed against the below eligibility criteria.

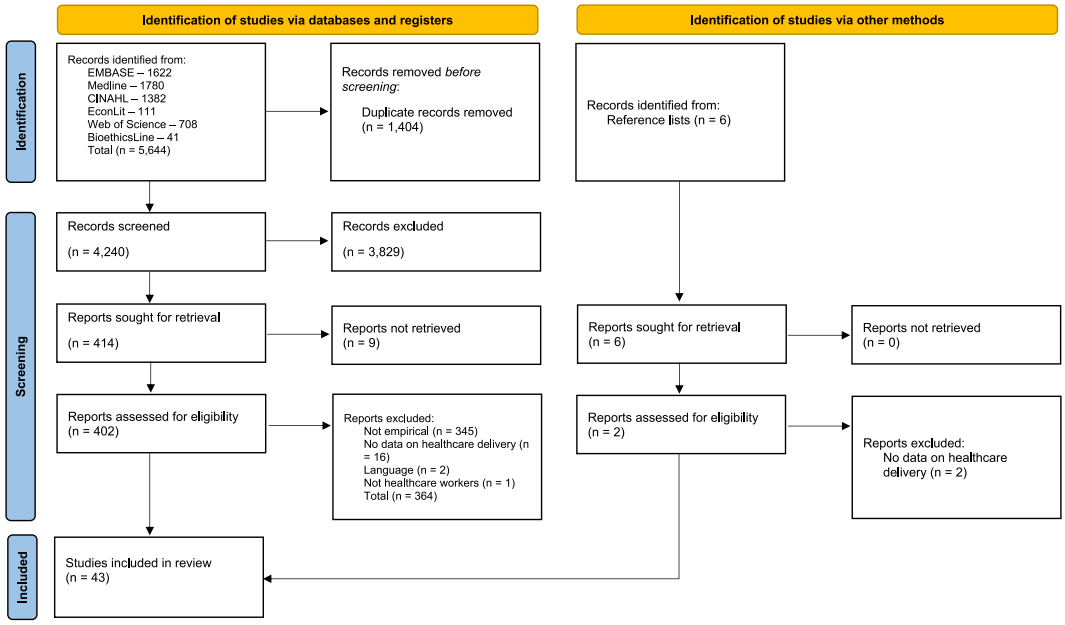

FIGURE 1 PRISMA 2020 flow diagram for new systematic reviews which included searches of databases, registers and other sources.

2.4 | Inclusion/exclusion criteria

As the broad aim of this paper was to examine the impact of strike action on healthcare delivery, papers were screened against a broad inclusion and exclusion criteria. Papers were included if they had extractable data related to the impact of strike action (For the purposes of these studies, we defined a strike as a temporary stoppage of work, which is distinct from a slow-down, work to rule strike or other forms of workplace resistance.) on healthcare delivery (i.e., admissions, presentation, quality indicators) and if they were peer reviewed and available in English. Papers were excluded if they provided anecdotal evidence (i.e. an expert opinion) about the impact of strike action or if they examined the impact of strike action on patient outcomes (i.e. mortality). Papers were included if they contained both information on patient outcomes and healthcare delivery. After assessment against the above criteria, 43 papers were included in this review (see Figure 1 and Supplemental File A).

2.5 | Data extraction

Data was extracted by RE and checked by SMW. Data was extracted related to the country where the research was conducted, the nature of the strike, the length of the strike, the methods used in the paper and the outcomes of the study (see Tables 1 and 2). Data extraction was guided by the aims of this review and the data that was consistently reported across studies. For example, while the extraction of further data was explored (i.e., the context and nature of the strike, along with the contingencies put in place to manage the disruption) this was not reported consistently across studies so this data could not be extracted (please also see our discussion regarding limitations of this evidence).

2.6 | Quality appraisal

While not essential for scoping reviews, we opted to carry out a quality appraisal of the literature to provide further insight into the relative strengths and weaknesses of the available literature. Given all studies were either

observational or cross-sectional two quality appraisal tools were utilised: The Newcastle-Ottawa Scale (NOS) to assess cohort studies and The Appraisal tool for Cross-Sectional Studies (AXIS) to assess cross-sectional studies. The NOS was developed to assess the quality of observations studies (case control and cohort studies). Studies are scored out of nine and across three domains; the study population, the comparability of these groups, and the ascertainment of exposure or outcome of interest.[11] The AXIS was developed to appraise cross-sectional studies, asking 20 questions about all aspects of the study.[12] For both instruments, higher scores indicate a higher quality study at less risk of bias. Studies were appraised by SA, HE, DL and LM, with each study appraised by at least two authors. Where there were conflicts these were resolved by discussions between each of the authors.

2.7 | Data summary and synthesis

Studies were collated to explore their descriptive characteristics. A textual narrative synthesis was then carried out, this approach allows for studies of different methodologies to be combined and synthesised to answer research questions.[13]

3 | RESULTS

3.1 | Descriptive results

The 43 papers included in this review represented a range of research carried out over several decades. Studies were carried out on almost every continent, with nine studies from the US, seven studies from Israel, six from the UK, six from Kenya, three from New Zealand, three from Spain, two from Canada and India and one from South Korea, South Africa, France, Finland and Denmark respectively. Research was therefore mainly carried out in higher income countries, with only eight studies carried out in low and middle income countries. Studies from Kenya, Israel and the UK reported on the same strikes, namely the doctors and nurses strike which occurred in Kenya throughout 2016/17, the Israeli doctors strike in 1983 and the UK junior doctor strikes in 2016. Studies explored a range of different strike actions, with the length of strike varying from one day[14] to 270 days.[15] The most studied strike was the 1983 Israeli doctors strike which lasted 118 days, with seven studies examining the impact of this strike. The vast majority of studies focussed on strikes carried out by doctors (n = 27). Seven studies examined nurse strikes, two examined ambulance strikes, while the remainder (n = 7) focussed on action where multiple professions were on strike. Thirty eight papers in this review employed an observational design, while the remainder were cross-sectional. In terms of outcomes 19 studies explored presentations to accident and emergency or admissions to hospital, 10 studies examined length of stay in hospital and waiting times, four studies examined the number of surgeries performed, three studies examined neonatal and maternal care and two examined the impact of strike action on the quality of care (see below, also see Table 1).

3.2 | Quality appraisal results

Thirty eight papers included in this review were reviewed against the criteria set out in the NOS. The quality of the papers assessed using the NOS criteria varied. Twelve papers scored eight out of nine[16-27] meaning they were generally higher quality. Six papers scored relatively low, scoring either two or three out of nine.[28-33] The remainder of the papers assessed against the NOS criteria scored either four, five or six out of nine. Papers that were assessed against the NOS criteria often measured multiple outcomes (for example mortality and presentations to hospital). In many cases, when it came to variables about the delivery of healthcare, questions about follow up of cohorts were not applicable.

TABLE 1 Summary of studies included in this review

Author	Year	Country	Aims	Nature or context of strike
Abdelkader, M.	1990	UK	This study examined the socio-demographic and clinical characteristics of patients admitted to a large psychiatric hospital during a 6 month period of industrial action by nurses.	This strike occurred in 1982 when industrial action was undertaken for almost 9 months. During that period, all admissions were discussed in detail with the nursing staff or their union representative, and only "emergency cases" as defined by the policy of the industrial action were accepted for admission.
Adam, Mary Beth	2018	Kenya	This study reports on the experience a faith-based Kenyan hospital, before, during and after a 100-day doctor strike by examining patient admissions and deaths in the time periods before, during and after the strike.	This action occurred in 2016-17 when doctors and nurse in Kenya went on strike for a combined 250 days over a period of 11 months. Staff who worked at the hospital in this study did not go on strike.
Aggarwal et. al.	2012	India	This study sought to explore the nature of strikes called by the Resident Doctors Association between 2006 and 2011.	This study reported multiple strikes in India between 2006 and 2011
Aro, S.	1987	Finland	This study examined changes in out-patient medical care utilization at a health centre in Finland during the Finnish doctors' strike in spring, 1984	In 1984, Finnish doctors employed in the public sector (health centres and most hospitals) went on strike. The strike began on 5 April, and after 7 weeks ended on 19 May 1984. At the third stage of the strike, from 7 May onwards about 60%–80% of the doctors in the public health sector had walked out. To ensure that essential patient care would not be disrupted it was agreed that a sufficient number of physicians be assigned to the hospitals and the health centres. In the health centre included in this study doctors only went on strike for 13 days.
Bhattacharyya, B. K.	1980	UK	This study explored the impact of an ambulance strike on a number of vulnerable patients unable to attend a day hospital in Northampton.	This action occurred in 1979 when ambulance staff went on strike. This curtailed attendance at day hospitals. While hospitals operated normally, many could no longer access them.
Bhuiyan, M. M. Z. U.	2012	South Africa	This study examined the impact of a 2010 strike in South Africa comparing performance indicators during the strike with a non-striking period.	This action occurred in 2010, when Doctors staged a 20-day strike. This study describes this strike as rendering the hospital "almost non-functional" and that almost 90% of the population in this region relied on public hospitals for care, with few alternatives available.
Crocker et. al.	2007	Canada	This study examined whether the prevalence of radiographically diagnosed pneumonia changed because of a lack of access to antibiotics during a strike	This action occurred in October 2002. In Newfoundland and Labrador, Canada. During the strike most family doctors were not functioning and paediatric care was only available through one hospitals emergency department
Daga, S. R.	1999	India	This study examined the impact of a strike on neonatal care during a doctors strike.	This strike occurred in 1991 and lasted for 69 days. While doctors were on strike, this unit had staff posted here and trained in neonatal care.

Length of strike	Profession on strike	Methods	Outcomes measured	Outcomes
270 days (approx)	Nurses	Quantitative - retrospective observational study. Data during the strike period were compared to a control period.	Admissions	Results suggest that during the strike action, admissions dropped by 30%. Thresholds for admission were raised across all diagnostic categories. Patient violence on admission and during stay was markedly less than expected. Chronic patients with a duration of illness of 10 years or more were least likely to be admitted during the action.
100 days	Doctors and nurses	Quantitative - retrospective observational study. Data during the strike period were compared to a control period.	Admissions	Results suggest that admissions remained stable during the strike period, with a non significant increase noted in obstetrics patients. The authors however noted that during the strike, a number of patients could not be admitted as demand exceeded their capacity.
n/a	Doctors	Quantitative - retrospective observational study. Data during the strike period were compared to a control period.	Outpatient appointments	Results suggest there was a significant decrease in outpatient appointments during strike action.
13 days	Doctors	Quantitative - retrospective observational study. Data during the strike period were compared to a control period.	Presentations to health centre	Results suggest that doctors visits decreased by 70% during the strike, and for urgent visits the decrease was 55 9%. Of the common urgent illnesses the relative decrease was greatest for "cold" and ill-defined "abdominal pains". Open wounds were treated normally although there was some indication that the wounds treated were more serious than the control period. There was an increase in presentation post-strike. The post-strike increase in visits suggests an increase in unmet needs. For all face-to-face encounters the increase was eight per cent, but for low back pain, urinary infection and hypertension the observed post strike rates were more than 40% higher than expected by pre-strike rates.
63 days	Ambulance staff	Quantitative - retrospective observational study.	Community based assistance needed - that is, meals on wheels and home visits by healthcare professionals	Results suggest there were no significant increases in the community services accessed including meals on wheels, home assistance, home visits by nurses, GPs and other organisations.
20 days	Doctors	Quantitative - retrospective observational study. Data during the strike period were compared to a control period.	Admissions (to hospital and surgical department) and operations conducted	Results suggest that the total number of patients admitted to the hospital and the surgical department during the strike was significantly lower (63% and 68% respectively) than during the control period. The number of surgeries decreased by 79% across the hospital and by 49% within the surgical department.
17 days	Doctors	Quantitative - retrospective observational study. Data during the strike period were compared to a control period.	A&E presentations, prescriptions, chest x-rays	Results suggest the number of prescriptions for pneumonia fell province wide. In the one hospital providing paediatric services the number of chest x-rays in A&E increased. As A&E also saw an increased number of patients during this time, the change in number of chest x-rays was not significant.
69 days	Doctors	Quantitative - retrospective observational study. Data during the strike period were compared to a control period.	Admissions and neonatal care (the number of births, preterm births, high-risk deliveries	Results suggest there were no differences in admissions during the strike. There was no significant difference in the number of high-risk deliveries and admissions and deaths at the special care unit, however the number of births did decrease in the post-srike period.

(Continues)

TABLE 1 (Continued)

Author	Year	Country	Aims	Nature or context of strike
Dierssen, T.	1997	Spain	The objective of this study was to assess the risk of nosocomial infection during the strike in the surgical departments of one hospital.	A national medical strike took place in Spain in the spring of 1995, from 8 May to 26 June. Only doctors went on strike; nurses and ancillary personnel remained on duty.
Furnivall, Daniel	2018	UK	This study examined the impact of the junior doctors' strikes in early 2016, investigating trends in the number of admissions (inpatients), outpatient appointments cancellations, accident and emergency (A&E) attendances, and mortality during strike periods.	This action included intermittent strikes undertaken by UK junior doctors from all specialities in the early months of 2016 (12 January, 10 February, 9–10 March and 26–27 April). The final action in April included the withdrawal of emergency services.
Griffiths, Paul	2017	UK	This study examined whether there was an increase in length of stay, in-hospital mortality and 30-day mortality for medical patients admitted during industrial action as a result of the junior doctors' contract dispute in a district general hospital in England.	This action included intermittent strikes undertaken by UK junior doctors from all specialities in the early months of 2016 (12 January, 10 February, 9–10 March and 26–27 April). The final action in April included the withdrawal of emergency services.
Harvey, Martyn	2008	New Zealand	This study examined the impact of a junior doctors strike on A&E efficiency, examining the hypothesis that increased seniority of emergency department medical staff would result in improved efficiency.	This action occurred in 2005 when an estimated 2500 junior doctors working in New Zealand District Health Board hospitals launched strike action for 5 days. In this case senior doctors continued to staff A&E departments.
Irimu, Grace	2018	Kenya	This study examined data related to 2016-17 strikes in Kenya, discussing impact on healthcare delivery and potential strategies to avoid future strike action.	This action occurred in 2016-17 when doctors and nurse in Kenya went on strike for a combined 250 days over a period of 11 months.
James	1979	US	This study examined the impact of a doctors strike on a number of variables including paramedic services and A&E presentations	This action occurred in 1976 when doctors in Los Angeles county went on strike. While the authors report no clear start and finish date they note that a slowdown began on January 1 and by February 1, there was a return to work.
Kaguthi, Grace Kiringa	2020	Kenya	This study examined the utilisation of health services and mortality during a 250 days doctor and nurse strike in Kenya.	This action occurred in 2016-17 when doctors and nurse in Kenya went on strike for a combined 250 days over a period of 11 months.
Kronborg, H.	2016	Denmark	This study examined the 2008 national strike among Danish nurses to identify the effects of care around birth on infant and mother health and maternal investments in the health of their newborns.	This action occurred in 2008 when there was a national strike amongst Danish nurses. All preventive and non emergency nurse services were impacted.

Length of strike	Profession on strike	Methods	Outcomes measured	Outcomes
50 days	Doctors	Quantitative - retrospective observational study. Data during the strike period were compared to a control period.	A&E Presentations	Results suggest there were more emergency presentations during the strike, bed occupancy rate was significantly lower during the strike and significantly fewer operations were conducted.
6 days (intermittent)	Doctors	Quantitative - retrospective observational study. Data during the strike period were compared to a control period.	Admissions, A&E attendance, outpatient appointments.	Results suggest that during the strike period there were fewer admissions (9% decrease), A&E attendances (7% decrease) and outpatient appointments (6% decrease) with a significant number of outpatient appointments cancelled (52% increase). Results suggest that the impact of the strike varied across regions, with the Yorkshire and the Humber region were disproportionately more affected by the industrial action.
6 days (intermittent)	Doctors	Quantitative - retrospective observational study. Data during the strike period were compared to a control period.	Admissions and length of stay in hospital	Results suggest that admissions or length of stay did not change significantly during the strike when compared to a control period.
5 days	Doctors	Quantitative - prospective observational study.	Admissions, waiting time and length of stay in A&E	Results suggest there were no differences in the number of A&E presentations between strike and control periods. Waiting time and length of stay were significantly lower during the strike period.
250 days (over 11 months)	Doctors and nurses	Quantitative - retrospective observational study. Data during the strike period were compared to a control period.	Admissions	Results suggest that during both the doctors' and nurses' 2017 strikes, there were marked reductions in admissions in all the four major disciplines—obstetrics, paediatrics, surgical and adult medicine
30 days (approx)	Doctors	Quantitative - retrospective observational study. Data during the strike period were compared to a control period.	Paramedic services, A&E presentations	Results suggest paramedic call-outs did not change during the strike period and that A&E visits decreased by about 4% when compared to the previous year.
250 days (over 11 months)	Doctors and nurses	Quantitative - retrospective observational study. Data during the strike period were compared to a control period.	A&E presentations and admissions	Results suggest there was a statistically significant decline in numbers of patients utilising the health facilities when doctors and nurses were on strike and also in the post-strike period, compared to a control period.
56 days	Nurses	Quantitative - prospective observational study. This study utilised population data to examine service delivery during and beyond the strike.	Prenatal and midwife consultations, length of stay in hospital (at birth), number of home visits by nurses after discharge, number of GP appointments	Results suggest that the strike reduced the number of prenatal midwife consultations, their length of hospital stay at birth, and the number of home visits by trained nurses after hospital discharge. We find that this reduction in care around birth increased the number of child and mother general practitioner (GP) contacts in the 14 first month. This increase is not maintained over a longer period, suggesting that parents substitute one type of care for another.

(Continues)

TABLE 1 (Continued)

Author	Year	Country	Aims	Nature or context of strike
Leskovan, John J.	2020	USA	This study examined data from three equal time periods following a strike involving both nurses and service/ technical staff lasting 63 days.	This action occurred in 2019 and involved nursing and technical services staff striking for 63 days.
McNamara, J. J.	1976	USA	This study involved a chart audit of emergency services provided by attending staff during the New York City House Officers' strike is compared to an audit of work previously performed by house staff.	This action occurred in 1975 and involved doctors striking for 5 days. The impact of the strike varied, however each prioritised emergency capabilities.
Montero-Perez et. al.	2014	Spain	This study examined the impact of a strike on care quality indicators and cost of imaging procedures, laboratory analyses, and emergency department human resources	This action occurred in 2012 when all junior doctors went on strike from 19 November to 3 December
Njuguna, John	2015	Kenya	This study analysed the impact of a 2 week healthcare worker strike in Mombasa County, Kenya.	This action occurred in 2014, in Mombasa County, Kenya. Health workers in government- owned facilities went on strike for 2 weeks.
Njuguna, John	2018	Kenya	This study sought to determine the strike's effect on immunisation services.	This action occurred in 2017 when nurses in Kenya went on strike for 150 days.
O'Shaughnessy, J.	1984	USA	This study explores the impact of strike action by nursing staff on a large teaching hospital	This action occurred in 1982 when nursing staff went on strike for 3 weeks. In advance of the strike, the hospital activated its strike plan. The administration and medical staff addressed many issues, such as admissions, staffing, and hospital service, in the event of unsuccessful bargaining and a strike.
Pantell and Irwin	1979	USA	This study examined the impact of the 1975 San Francisco physicians' strike on the number of appendectomies performed.	This action occurred in 1975 when anaesthesiologists in five San Francisco Bay area counties conducted a month-long strike which largely curtailed surgery; only emergency services were provided.

Length of strike	Profession on strike	Methods	Outcomes measured	Outcomes
63 days	Nurses and technical staff	Quantitative - retrospective observational study. Data during the strike period were compared to a control period.	Length of stay (ICU), ventilator days and patient transfers	Results suggest no significant differences in ICU length of stay, ventilator days, or transfers to other hospital. Furthermore, rates of complications in trauma patients did not seem to be affected by the strike.
5 days	Doctors	Quantitative - retrospective observational study. Data during the strike period were compared to a control period.	Length of stay (A&E), quality of care (chart audit)	Results suggest that there were no significant differences in relation to length of stay in emergency. Quality of care and level of service was maintained during the strike. Nevertheless the usual quality of emergency care, as measured by these instruments, was poor in both the strike and control periods.
15 days	Doctors	Quantitative - retrospective observational study. Data during the strike period were compared to a control period.	Presentations, length of stay, tests and imaging ordered	Results suggest that the strike had no impact of patient presentations or admissions. Time spent in the observation area increased, while time until seen by a doctor decreased. The number of laboratory tests and imaging requests decreased during the strike.
14 days	Health workers	Quantitative - retrospective observational study. Data during the strike period were compared to a control period.	Admissions, outpatient appointments, radiology procedures, maternal health and family planning, dental clinic	Results suggest that attendance decreased during the strike across all measures between 41% and 79% when compared to a control period.
150 days	Nurses	Quantitative - retrospective observational study. Data during the strike period were compared to a control period.	Immunisations - number of immunised infants	Results suggest a significant difference in the mean number of fully immunised infants during the strike period and non- strike period. A decline of 56.9% was reported during the strike. Faith- based health facilities reported an increase of 251.6% during the strike period
21 days	Nurses	Qualitative - case report. Although this study refers to numbers or presentations and admissions it primarily provides an overview of how a hospital emergency department responded to a strike	A&E presentations, admissions and financial impact	Results suggest, A&E presentations, admissions decreased substantially. As the hospital implemented a no ambulance policy, patients who presented were also less complex. The hospital reported significant financial losses because of the strike.
30 days	Doctors	Quantitative - retrospective observational study. Data during the strike period were compared to a control period.	Appendectomies	Results suggest that the ratio of normal to inflamed appendices removed was no different during the strike than it was during the control period, and no differences were noted in the percentage of cases perforating in the strike month when compared with the control period. In addition, patients seeking care for appendicitis during the boycott month did not experience delays.

(Continues)

TABLE 1 (Continued)

Author	Year	Country	Aims	Nature or context of strike
Patel, N. P.	2020	USA	This study examined the financial and operational impacts a nursing strike had on perioperative services.	This action occurred in 2018, when nurses at the University of Vermont Medical Centre went on strike for 2 days in July 2018 forcing the hospital administration to hire and train 600 new travelling nurses a week before the strike to fill scheduling gaps.
Pilpel, D.	1985	Israel	This study examined utilization of health services during a 118-day doctors' strike	This action occurred in 1983 over 118 days. All doctors in government funded facilities went on strike. The Israel Medical Association, which called for the strike established ad hoc health centres all over the country to provide medical care on a fee-for-service basis.
Prinsley, D. M.	1971	UK	This study examined the impact of industrial action by ambulance employees on the operation of a day hospital	This action occurred in late 1970 when during a period of 5 weeks ambulances carried only emergencies-dealing with accidents and urgent admissions to hospital. Outpatients and patients discharged from hospital were not carried, and patients due to attend the day hospital could receive treatment only if taken by relatives in cars or by taxi.
Reuter, P. G.	2018	France	This study examined the impact of a 1 day GP strike and terrorist attacks on a call centre's activity.	This action occurred on 13th November 2015 when GPs went on strike for the day. This action occurred on the same day as a terrorist attack in Paris.
Robinson, Geoffrey	2008	New Zealand	This study explored the experience of the emergency department and internal medicine services at Wellington Hospital during the national strike, in which medical services were primarily provided by specialist consultants in addition to, or as part of, their routine work.	This action occurred in 2005 when an estimated 2500 junior doctors working in New Zealand District Health Board hospitals launched strike action for 5 days. In this case senior doctors continued to staff A&E departments.
Roemer and Schwartz	1979	USA	This study examined the impact of a 35 days doctors strike on patient perceptions about access to care, mortality statistics and healthcare delivery in hospitals	This action occurred in 1976, when up to 75% of doctors went on strike for 35 days.
Ron, A.	1985	Israel	This study explored the utilisations of care for children during a doctors strike in Israel.	This action occurred in 1983 over 118 days. All doctors in government funded facilities went on strike. The Israel Medical Association, which called for the strike established ad hoc health centres all over the country to provide medical care on a fee-for-service basis.

Length of strike	Profession on strike	Methods	Outcomes measured	Outcomes
2 days	Nurses	Quantitative - retrospective observational study. Data during the strike period were compared to a control period.	Efficiency measures (productivity impacts in relation to operating room efficiency)	The changes in overall OR workflow resulted in additional expenses, loss of individual productivity and concomitant lost revenue from cancelled cases. Some operational metrics improved.
118 days	Doctors	Quantitative - cross sectional survey. Medical students home-interviewed all (1,663) members of 423 families.	Perceived need and access to care (from patient perspective)	Results suggest that a total of 39% (649 people) perceived a subjective need for health care at least once during the month preceding the interview. A total of 813 episodes of "need" were recorded. Forty-six percent of those with perceived "need" sought medical care in all episodes of need, 6% in some episodes, and 49% sought no medical advice for any of their morbidity episodes. It was found that the socioeconomic status made a major contribution to the variation in the proportion of met needs.
35 days	Ambulance staff	Quantitative - cross sectional survey. Patients (n = 248)	Patients who did not return to the hospital after a 5 weeks strike by ambulance workers	Results suggest that almost 10% of the patients failed to return for treatment after the conclusion of the strike.
1 day	Doctors	Quantitative - retrospective observational study. Data during the strike period were compared to a control period.	Volume of calls for emergency medical assistance	While the GP strike resulted in an increased number of calls related to patient medical files, calls did not increase substantially. In the time after the terrorist attack, calls for medical assistance increased substantially and significantly more mobile intensive care units were dispatched.
5 days	Doctors	Quantitative - retrospective observational study. Data during the strike period were compared to a control period.	Admissions, A&E waiting time and length of stay	Results suggest admissions for internal medicine did not change significantly during the strike. A&E waiting time and length of stay were significantly shorter during the strike when compared to the control period. Results also suggest that one senior doctor carried the workload of at least two junior doctors in emergency and three junior doctors in internal medicine.
35 days	Doctors	Quantitative - cross sectional survey and retrospective observational study. Data during the strike period were compared to a control period	Access to care (patient perceptions), utilisations of services and impact on healthcare delivery	Results suggest that only a small percentage of people were inconvenienced by the withdrawal of elective surgical services (other types of care were continued). In the hospitals services were disrupted and there was a decline in occupancy.
118 days	Doctors	Quantitative - cross sectional survey. Interviews/survey with 253 families (and 613 children)	Access to care and utilisation of services (patient perceptions)	Results suggest that the majority of parents who reported a child's illness did not defer seeking care. They first generally sought care from nurses in community clinics and hospital A&E, while care from physicians working privately was used to the same extent as the Alternative Medical Centers.

(Continues)

TABLE 1 (Continued)

Author	Year	Country	Aims	Nature or context of strike
Ruiz, Milagros	2013	UK	This study examined the impact of a 24 h doctors strike in June 2012 on hospital activity in English hospitals.	This action occurred in June 2012. Although exact figures are not known, it was reported that 8% of doctors across England took industrial action. The impact of the strike was varied. In the London area, >90% of all hospitals worked normally (approximately 10% of planned operations were postponed) and 83% of GP practices were said to have worked normally, with the remaining 17% open but dealt only with urgent cases. The general view reported in the national news was that non-emergency cases and outpatient appointments were affected and a significant number of cancelled appointments had to be re-scheduled.
Salazar, A.	2001	Spain	This study examined the indicators of activity and quality within the emergency department (ED) during a resident physicians' strike.	This action occurred in 1999 when all resident physicians, with the unique exception of family medicine residents, participated in a strike period of nine non-consecutive 24-h days in Spanish teaching hospitals. This unexpected circumstance precipitated a 24-h coverage by experienced staff physicians in the ED during the SP.
Scanlon et. al.	2021	Kenya	This study examined the impact of strike action on maternal and child health services	This action occurred in 2017 when health workers were on strike for about 250 days, including a 100 days doctor strike and 150 days nurse strike.
Sim et. al.	2021	South Korea	This study reports on the impact of a nationwide junior doctors strike in South Korea.	This action occurred from 21 August 21 to 7 September when all junior doctors went on a nationwide strike in South Korea.
Slater, P. E.	1984	Israel	This study examined changes in emergency department utilization at a major Jerusalem regional hospital during the 4-month-long Israel doctors' strike.	This action occurred in 1983 over 118 days. All doctors in government funded facilities went on strike. The Israel Medical Association, which called for the strike established ad hoc health centres all over the country to provide medical care on a fee-for-service basis. The hospital included in this study was unaffected by the strike (Hadassah University Hospital)
Slater, P. E.	1984	Israel	This study examined a sample of emergency department charts from Hadassah University Hospital, Mount Scopus, Jerusalem, was examined for the period of the 1983 Israel doctors' strike and from an appropriate control period in 1982.	This action occurred in 1983 over 118 days. All doctors in government funded facilities went on strike. The Israel Medical Association, which called for the strike established ad hoc health centres all over the country to provide medical care on a fee-for-service basis. The hospital included in this study was unaffected by the strike (Hadassah University Hospital)
Slater, P. E.	1984	Israel	This study examined changes in A&E utilization at a hospital during a 1983 doctors strike.	This action occurred in 1983 over 118 days. All doctors in government funded facilities went on strike. The Israel Medical Association, which called for the strike established ad hoc health centres all over the country to provide medical care on a fee-for-service basis. The hospital included in this study was unaffected by the strike (Shaare Zedek Hospital)

Length of strike	Profession on strike	Methods	Outcomes measured	Outcomes
1 day	Doctors	Quantitative - retrospective observational study. Data during the strike period were compared to a control period.	Admissions, A&E presentations, outpatient appointments and cancellations, day surgery cases	Results suggest that compared with the control period, on the day of the strike, emergency admissions fell by 2.4% while the elective admissions decreased by 12.8%. There was a 7.8% drop in the number of outpatients seen by medical staff on the day of the strike and a 45.5% increase in the number of cancelled appointments by NHS hospitals, while A&E attendances dropped by 4.7%. The impact of the strike across regional Health Authorities in England was varied.
9 days	Doctors	Quantitative - retrospective observational study. Data during the strike period were compared to a control period.	Length of stay, rates of laboratory tests and radiology procedures, numbers of patient walkouts, patient/physician ratios, emergency hospital admission rates, home discharge rates, unscheduled return rates	This study demonstrated that replacing residents with staff physicians resulted in fewer laboratory tests ordered, fewer radiographs ordered, and shorter lengths of stays in the ED. No differences were observed in presentations or admission rate.
250 days	Doctors and nurses	Quantitative - retrospective observational study. Data during the strike period were compared to a control period.	Outpatient appointments, immunisation rates	Results suggest that those who gave birth during the strike year were less likely to attend all required antenatal appointments, were more likely to give birth outside hospital. Immunisation rates did not change between strike and non-strike periods.
18 days	Doctors	Quantitative - retrospective observational study. Data during the strike period were compared to a control period.	A&E presentation and length of stay	Results suggest both A&E presentations and time waiting decreased significantly during the strike period.
118 days	Doctors	Quantitative - retrospective observational study. Data during the strike period were compared to a control period.	A&E presentations, admissions, rates of laboratory tests and radiology procedures	Results suggest that he number of A&E visits increased by 35% over the control period. There were larger increases in female visitors than male and larger increases in visits by children and in women of childbearing age. Use of laboratory tests and radiological procedures increased slightly and hospital admissions from A&E were unchanged.
118 days	Doctors	Quantitative - retrospective observational study. Data during the strike period were compared to a control period.	Chart quality	This study suggests that there were no major differences in the recording of charts between strike and control periods and, to the extent that chart quality reflects quality of care, no evidence was found that quality of care was adversely affected by the strike despite an increase in patient load.
118 days	Doctors	Quantitative - retrospective observational study. Data during the strike period were compared to a control period.	A&E presentations, admissions	Results suggest that A&E visits increased during the strike compared to a control period. The largest increase in visits by adults (60%–70%) was in persons aged 40–64 years and there was also a large and unexplained increase in ED visits by girls under age 8. Admissions increased amongst females.

(Continues)

TABLE 1 (Continued)

Author	Year	Country	Aims	Nature or context of strike
Slater, P. E.	1983	Israel	This study examined changes in A&E utilization at a major Jerusalem teaching hospital during a 1983 doctors strike.	This action occurred in 1983 over 118 days. All doctors in government funded facilities went on strike. The Israel Medical Association, which called for the strike established ad hoc health centres all over the country to provide medical care on a fee-for-service basis. The hospital included in this study was unaffected by the strike (Hadassah University Hospital)
Stabler, C.	1984	Canada	This study examined the impact of a province wide nurses strike on a hospital where nurses didn't strike.	This action occurred in 1982 and lasted for 4 weeks. This strike resulted in the closure of 57% of the acute care beds, including 47% of the intensive care beds in Calgary. The hospital in which the study was conducted did not have staff go on strike.
Stovall, Jeffrey G.	2004	USA	This study examined a strike that occurred within a community mental health centre in Worcester, Massachusetts, to determine the impact among health care staff and patients with severe and persistent mental illnesses.	This action occurred in 1999. Nurses, social workers, case workers, and residential staff went on a strike that lasted 30 days at a community mental health centre in Worcester, Massachusetts. Essential clinical and residential services were maintained during the strike, because psychiatrists and non-union clinical and administrative staff continued to work.
Thornton, Vanessa	2008	New Zealand	This study described the response and performance of a hospital emergency department during a 5-day junior doctor strike.	This action occurred in 2005 when an estimated 2500 junior doctors working in New Zealand District Health Board hospitals launched strike action for 5 days. In this case senior doctors continued to staff A&E departments.
Weingarten, M. A.	1985	Israel	This study used the Israel doctors strike of 1983 to compare the effect the introduction of a direct charge against pre-paid insurance arrangements, in three different settings—suburban, rural and working-class small town.	This action occurred in 1983 over 118 days. All doctors in government funded facilities went on strike. The Israel Medical Association, which called for the strike established ad hoc health centres all over the country to provide medical care on a fee-for-service basis.
Youssef et. al.	2021	US	This study examined the impact of a nursing strike on an A&E department	This action occurred in 2017 in an academic teaching hospital in Boston. Nurses went on strike for 5 days and were replaced by nurses who were hired to cover staff shortfall.

Length of strike	Profession on strike	Methods	Outcomes measured	Outcomes
118 days	Doctors	Quantitative - retrospective observational study. Data during the strike period were compared to a control period.	A&E presentations, admissions	Results suggest that the A&E visits increased by approximately 20% compared to a control period. More A&E presentations patients were 50 and older, and more were seen during the morning shift compared to the pre-strike control period. The percentage of A&E patients admitted to hospital fell, although the absolute number of admissions was the same as during the control period. The authors concluded that the relatively small increase in A&E volume was explained by the fact that doctors striking the government and major institutions continued to treat patients either privately or at impromptu medical aid stations.
28 days	Nurses	Quantitative - retrospective observational study. Data during the strike period were compared to a control period.	Admissions, length of stay, readmissions	Results suggest that A&E presentations increased, admissions to hospital (taking the increased number of presentations into account) did not significantly change, length of stay and readmissions did not significantly change compared to a control period.
30 days	Health workers	Quantitative - retrospective observational study. Data during the strike period were compared to a control period. Cross sectional survey regarding patient perceptions of quality of care	Admissions (preceding and following a strike) and patient perceptions of quality of care	Results suggest no significant change in the number of hospital admissions in the 12 months preceding the strike and in the 12 months following the strike. Patient perceptions related to quality of care, during the strike and the preceding 12 months showed no differences in satisfaction with services, including the perception of accessibility of staff, accessibility of leisure activity, staff's attention to the residents' treatment goals, and the ability to handle emergencies.
5 days	Doctors	Quantitative - retrospective observational study. Data during the strike period were compared to a control period.	A&E presentations, length of stay, patients who did not wait to be seen, maximum waiting time	Results suggest that total presentations were not different between strike and control periods. Despite fewer total doctor shifts patient waiting times were shorter. There was also a reduction in patients who did not wait to be seen, A&E length of stay and referrals to inpatient services
118 days	Doctors	Quantitative - retrospective observational study. Data during the strike period were compared to a control period.	Presentations, prescription rates, radiological and laboratory referral rates, referral to A&E, referral to specialists, admission to hospital	Results suggest that the introduction of a charge greatly reduced the consultation rate; more of the patients consulting received prescriptions, especially for antibiotics; laboratory investigation. Referral and admission to hospital were unchanged, but referral for specialist consultation was reduced; there was no change in the proportion of follow-up visits, but house calls were more frequent. These trends were stable over the 4-month period of the strike, and partial reimbursement of the fee did not change the picture significantly.
5 days	Nurses	Quantitative - retrospective observational study. Data during the strike period were compared to a control period.	Presentations, length of stay, transport to hospital	Results suggest A&E volume decreased, as did transport to hospital. Waiting time decreased for discharged patients however was unchanged for patients who were admitted.

TABLE 2 Studies summarised by healthcare delivery outcomes measured

	Outcomes						
	Admissions/ presentations	Outpatient appointments	Length of stay/ waiting time	Tests/ imaging	Surgical	Upstream impacts	Other
Abdelkader	x						
Adam						x	
Aggarwal et. al.		x					
Aro							x
Bhattacharyya						x	
Bhuiyan	x						
Crocker et. al.						x	
Daga	x						x
Dierssen					x		
Furnivall	x	x					
Griffiths	x		x				
Harvey	x		x				
Irimu	x						
James	x						x
Kaguthi	x						
Kronborg						x	
Leskovan			x				x
McNamara			x				x
Montero-Perez et. al.	x		x	x			
Njuguna (2015)	x	x		x			
Njuguna (2018)						x	
O'Shaughnessy	x						x
Pantell and Irwin					x		
Patel							x
Pilpel						x	
Prinsley							x
Reuter							x
Robinson	x		x				
Roemer and Schwartz					x	x	
Ron						x	
Ruiz	x	x			x		
Salazar	x		x	x			x
Scanlon et. al.		x					x
Sim et. al.	x		x				
Slater (1984)						x	
Slater (1983)						x	
Slater (1984)						x	

TABLE 2 (Continued)

	Outcomes						
	Admissions/ presentations	Outpatient appointments	Length of stay/ waiting time	Tests/ imaging	Surgical	Upstream impacts	Other
Slater (1984)						x	
Stabler						x	
Stovall	x						x
Thornton	x		x				x
Weingarten						x	
Youssef et. al.	x		x				x

For example, follow up was not necessary to determine the number of presentations to hospital post-strike, follow up on the other hand may have been necessary to determine mortality related to a strike, which was not explored in this review. This means a number of studies could be scored out of seven if these criteria were excluded. Given this, the overall quality of the studies, when measuring healthcare delivery outcomes, was generally good. Four papers were reviewed against the criteria set out in the AXIS. In terms of the studies assessed against the AXIS criteria, papers scored ten[34,35] eleven[36,37] and thirteen,[38] meaning all four studies were of acceptable quality. One paper was not reviewed, as while it contained data it was reported as a case study.[39] No studies were excluded on the grounds that they scored poorly on these instruments (please also see Supplemental File A for quality appraisal results).

3.3 | Presentations and admissions

Nineteen studies explored the number of presentations to emergency or admissions to hospital. Data was extracted to explore the degree to which emergency presentations and admissions to hospital were impacted by strike action. Comparisons were made between strike and pre-strike, post-strike and other periods of time (for example, some studies compared a strike period to a mean rate calculated over a number of months). Comparisons were also made between admissions and presentations pre- and post-strike. These results are summarised in Table 3. Results suggest that both presentations and admissions dropped dramatically when comparing pre-strike to strike periods, between 73%[40] to 0%[24] decrease. However, two studies by Robinson, McCann, Freeman and Beasley[41] and Daga and Shende,[42] conducted in New Zealand and India reported an increase in admissions, with a 12% and 56% increase in admissions reported respectively during strike periods. Comparing a strike period to post-strike period, presentations and admissions again increased substantially post-strike, between 8%[18] to 29%.[43] Again, Daga and Shende[42] was an outlier, with a reported decrease of 17% of admissions in the post-strike period. With the exception of Daga and Shende[42] of the studies that offered pre and post comparisons, while presentations often increased after a strike, they were either similar[23] or substantially lower than pre-strike levels.[43] Similar comparisons were observed in studies that compared aggregated time periods to strike periods with presentations and admissions decreasing between 5%[14] and 34%.[15,39] Three studies had data that could not be extracted, but reported similar observations to those above, namely that there were marked reductions in admissions during a strike when compared to a non-strike period.[44–46]

3.4 | Waiting time and length of stay

Ten studies examined how strikes impacted length of stay in hospital and waiting times. All studies that did so found no relation to strike action and increased waiting times or length of stay in hospital, with some studies showing that waiting times decreased.

TABLE 3 Number of presentations/admissions and % change, pre, during and post strike periods

Author	Country	Length of strike (days)	Pre-strike	Strike	Post-strike	Other period of time	% Change pre-strike x strike	% Change strike x post-strike	% Change pre x post	% Change strike x other
Emergency presentations										
Furnivall	UK	6		319,530		343,325				−6.93%
Harvey	New Zealand	5		608	683			12%		
Kaguthi	Kenya	250	385,578	203,313	262,002		−47%	29%	−47.17%	
Montero-Perez	Spain	15	4931	4935			0%			
O'Shaughnessy	USA	21		760		1140				−33.33%
Ruiz	UK	1		49,179		51,626				−4.74%
Salazar	Spain	9		2610		3634				−28.18%
Sim	South Korea	18	1496	1121			−25%			
Thornton	New Zealand	5	1020	922	1070		−10%	16%	4.67%	
Youssef	USA	5	641	503			−22%			
Admissions										
Abdelkader	UK	270		138		208				−34%
Bhuiyan	South Africa	20	976	262			−73%			
Daga	India	69	71	111	95		56%	−17%	25%	
Furnivall	UK	6		314,946	346,597			9%		
Griffiths	UK	6	-	345	376			8%		
Kaguthi	Kenya	250	150,365	121,803	137,097		−19%	11%	−10%	
Montero-Perez	Spain	15	400	366			−9%			
Njuguna	Kenya	14	2770	1209			−56%			
Robinson	New Zealand	5	94	105			12%			
Ruiz	UK	1		40,500		44,592				−9%
Salazar	Spain	9	1035	792			−23%			
Sim	South Korea	18	690	535			−22%			

Griffiths, O'Mahony and Wilson[18] found no differences between length of stay during the UK junior doctors strike when compared to a control period. Similarly in two studies from the US, during a 5 days doctors strike, McNamara and Greene[20] reported that there were no significant differences in relation to length of stay in emergency and during a 63 days nursing strike. Leskovan, Pahl, Stringfellow, Buderer, Moore, Afaneh, Raimonde, Novakovic and Stausmire[19] reported no significant differences in intensive care length of stay or number of days on a ventilator. A number of other studies stand in contrast, suggesting more mixed results or that strike action decreased waiting times and length of stay in hospital. Examining a nursing strike in the US, Youssef, Mosto, Barnewolt, Youssef and Weiner[27] found that length of stay decreased for discharged patients, but did not change for those admitted.

The remainder of the studies that found mixed or decreased wait times examined junior doctor (For these purposes we use the term 'junior doctor' in line with how it is typically used, to refer to qualified doctors in post-graduate training) strikes.[23,24,26,41,47,48] In Spain, Montero-Pérez, Calderón De La Barca-Gázquez, Calvo-Rodríguez, Jiménez-Murillo, Tejedor-Benítez and Roig-Rodríguez[24] found that while time spent in the observation area increased, time to first see a doctor decreased in an emergency department. In another study conducted in Spain, Salazar, Corbella, Onaga, Ramon, Pallares and Escarrabill[47] found that waiting times in emergency decreased during a 9 day strike. In South Korea, again during a junior doctor strike Sim, Choi and Jeong[26] found that wait time decreased during strike action. Three studies from New Zealand examining the same junior doctor strike reported a decrease in emergency wait times across the respective study hospitals.[23,41,48]

3.5 | Surgery

Four studies examined how strike action impacted the number of surgeries performed. Ruiz, Bottle and Aylin[14] reported that during a 24 h, UK doctors strike, day surgery cases decreased by 11.8%. Longer strikes by doctors appeared to have a more substantial impact. For example, Roemer and Schwartz[35] reported that during a 35 days US doctors strike, surgeries decreased by almost 19% when compared to a control period. Similarly, during a 50 days doctors strike in Spain, Dierssen, Farinas-Alvarez, Llorca, Antolin and Delgado-Rodriguez[49] reported a 41% drop in surgeries performed. A study by Pantell and Irwin[50] stands in contrast to those above however, suggesting that during a 30 days doctor strike in the US, there was no difference in the number of appendectomies during the strike, when compared with a control period. The study notes that emergency surgeries were continued throughout the strike, which most likely explains this result.

3.6 | Outpatient services

Five studies explored more general 'outpatient services'. Overall, results suggest that during strikes there was a significant increase in the number of outpatient appointment cancellations and decrease in the number of appointments carried out. Returning to Furnivall, Bottle and Aylin[17] which examined England-wide data, there was a 52% increase in the cancelation of appointments, and the number of appointments decreased by 6% during the 5-day junior doctor strike. Similar results were found by Ruiz, Bottle and Aylin[14] who examined the impact of a 24 h doctors strike in the UK. Outpatient appointments decreased by almost 8%, while almost 46% of outpatient appointments were cancelled on the day of the strike. Similarly, during a 14 days strike by healthcare workers in Kenya, Njuguna[29] also reported that outpatient appointments decreased by 67% during the strike. Examining a 250 days strike in Kenya, Scanlon, Maldonado, Ikemeri, Jumah, Anusu, Bone, Chelagat, Keter, Ruhl, Songok and Christoffersen-Deb[25] similarly found that participants who gave birth during the strike year were less likely to attend all required antenatal appointments. Examining multiple strikes between 2006 and 2011 in India, Aggarwal, Yadav, Singh, Sharma and Sharma[32] similarly found that there was a significant drop in the number of patients seen in an outpatient department.

3.7 | Other outcomes related to healthcare delivery

Three studies examined the impact that strike action had on neonatal and maternal care. Njuguna[29] reported that during a 14 days health worker strike in Kenya, the number of births in the hospital decreased as did attendance for other maternal and child health and family planning appointments. Similarly, in addition to their findings above, related to a 250 days strike in Kenya Scanlon, Maldonado, Ikemeri, Jumah, Anusu, Bone, Chelagat, Keter, Ruhl, Songok and Christoffersen-Deb[25] found that length of stay in hospital during birth decreased significantly during the strike period, while those who were impacted by strike action were more likely to give birth outside a hospital (at home, with and without support). Kronborg, Sievertsen and Wust[51] reported that during a 56 days nurse strike in Denmark the number of prenatal midwife consultations and the number of home visits after discharge both decreased significantly.

Two studies examined variables related to quality of care during strike action. McNamara and Greene[20] conducted a patient chart audit in an emergency department during a 5 day doctor strike. They report that quality of care and level of service as indicated by patient charts was maintained during the strike, however, the baseline quality of care as measured by these instruments, was poor in both the strike and control periods (To measure quality this study employed an audit instrument which examined a range of 'structural and process elements' in the medical record including the completeness of patient information, treatment and follow up plans). In addition, a further study provides insight into quality of care turning to patient perceptions of the impact of strike action. Stovall, Hobart and Geller[45] reported that during a 30 days strike at a community mental health centre, patient perceptions related to quality of care during the strike were not significantly different, this included how patients perceived their access to staff and leisure activities, along with the staff's attentiveness to patients and their ability to deal with emergencies.

Three studies examined the impact that strike action had on the number of laboratory tests and radiological procedures ordered and conducted, with both suggesting that during strike action, both decreased significantly.[24,29,47] One study examined readmissions to hospital, reporting no change in readmissions during the strike and control periods.[47] Three studies also examined the impact of strike action on ambulance/paramedic services. While James[46] found no difference in the number of paramedic call-outs, Youssef, Mosto, Barnewolt, Youssef and Weiner[27] suggested that paramedic transports decreased by almost 50%. Finally, Prinsley[34] reported that almost 10% of the patients failed to return for treatment (to a day hospital) after being unable to attend for 35 days because of an ambulance strike.

Three studies stand alone when compared to those discussed above. Njuguna[29] examined the impact of a 150 days nurse strike in Kenya on immunisation rates, reporting a decline in immunisation rates of almost 57% during the strike. Examining the same strike, Scanlon, Maldonado, Ikemeri, Jumah, Anusu, Bone, Chelagat, Keter, Ruhl, Songok and Christoffersen-Deb[25] found that while oral polio vaccine rates were the same between strike and non-strike groups, those impacted by the strike received their vaccination later than those who were not impacted. Patel, Hudson, Mayhew, Breidenstein, Marmanides and Tsai[52] examined operating room workflow during a 30 days US doctor strike, with results suggesting that strike action incurred additional expenses, a loss of productivity and loss of revenue from cancellations.

3.8 | Upstream impact of strike action

Examining healthcare delivery within institutions that were directly impacted by strike action only says so much. With the above data alone, we could make few conclusions about whether or if patients sought treatment elsewhere or if people delayed seeking treatment. Fortunately, nine studies examined (or contained data on) on what we will call the upstream impact of strike action. These studies were usually conducted in institutions where staff did not strike or continued to work during a strike that was occurring elsewhere. Other insights on the broader impact of strike action also comes from patient surveys regarding their access to and use of services during a strike. These studies will be discussed below.

The most evidence of the upstream impact of strike action comes from the 118 day Israel doctors strike, with a series of studies examining the impact of the strike on hospitals that did not participate and the impact that this

had on utilisation of care. Slater, Ellencweig, Bar-Tur, Ben-Tuvia and Ginat[21] reported that in a hospital in Jerusalem (Hadassah University Hospital) that was not on strike, the number of emergency visits increased by 35% compared to the control period. An increased number of female (compared to male) visitors and children was noted. Hospital admissions from emergency were unchanged. In another paper, examining the same hospital during the same strike, it was reported that emergency visits increased by approximately 20% compared to a control period.[53] Similar results were found in another hospital (Shaare Zedek Hospital), with the largest increase in emergency visits by adults (60%–70%) in those aged 40–64 years.[54] One final study examined the quality of patient charts (In this study quality was measured by counting the number of items present on a patients chart, such as temperature, blood pressure, treatment and follow up plan) in these hospitals, suggesting that despite being under increased load, chart quality was maintained throughout the strike.[55] Further insight about the Israel doctors strike comes from patient surveys. Pilpel, Naggan and Sarov[38] conducted a survey with 1663 participants. It was reported that 649 participants (39%) felt they had a need for healthcare, at least once during the month prior to the interview. Of those who felt they had a need for care, 46% sought it in all cases, while 49% did not seek care at all. A major contributor to the variation that existed in this study was socioeconomic status, with those from lower socioeconomic backgrounds more likely to feel their needs had not been met. Ron, Karsh, Zipkin and Kahan[37] also conducted a survey with 253 families, comprise of 613 children. The majority of parents who reported a child's illness did not defer seeking care. They first generally sought care from nurses in community clinics and hospital emergency departments, with private physicians used to a lesser extent. Weingarten and Monnickendam[31] give further insight into these results suggesting that while health services were provided within makeshift clinics in Israel throughout the strike, these services required payment (in lieu of services generally having no charge at point of contact). This study suggests that the introduction of a charge greatly reduced the consultation rate and that these trends were stable over the 4-month period of the strike, furthermore, partial reimbursement of the fee did not change the number of people seeking treatment significantly.

Studies from other countries also suggest that people generally seek treatment elsewhere during strike action. For example, Stabler, Schnurr, Powell, Stewart and Guenter[22] reported that during a 28 day Canadian nurse strike, in an institution that was not on strike, emergency presentations increased while admissions to hospital (taking the increased number of presentations into account) did not significantly change. Reporting on a survey, Roemer and Schwartz[35] suggest that a 35 days US doctors strike only inconvenienced a small number of people, all who were waiting elective surgeries. Bhattacharyya, Isherwood and Sutcliffe[28] reported there were no significant increases in the community services accessed including meals on wheels, home assistance, home visits by nurses, general practitioners (GPs) and other organisations during a 63 days UK ambulance staff strike which impacted day hospital patients. Finally, looking at maternity care during a 56 days nurse strike in Denmark, Kronborg, Sievertsen and Wust[51] reported that while there was a reduced number of prenatal and midwife consultations during the strike, the number of child and mother GP contacts increased in the 14 first months after birth.

While some of these studies appear to show that strike action had minimal upstream impact and that other systems and institutions were able to absorb these changes, this appears to be largely context dependent, that is, in many cases alternate services may not be available. In examining immunisation rates in Kenya, during a 150 days nurse strike, Njuguna[56] reported that immunisation rates increased in non-strike faith based hospitals significantly, up to 10 fold. Adam, Muma, Modi, Steere, Cook, Ellis, Chen, Shirk, Muma Nyagetuba and Hansen[57] reported that during the related Kenyan doctor strike during the same period at a faith-based hospital, during the strike patients could not be admitted as demand exceeded their capacity. Similarly, in a hospital that was the only one providing paediatric care during a strike, Crocker, Cramer and Hutchinson[33] reported a significant increase in presentations.

Finally, and a study that stands alone to all others here, Reuter, Orsini, Grave, Linval, Akodad, Goix, Adnet and Lapostolle[58] examined the impact of a 1 day GP strike on 13th November 2015 (a day which coincided with a terrorist attack in Paris) on an emergency call centre. While the GP strike resulted in an increased number of calls related to patient medical files, emergency calls did not increase substantially. Perhaps unsurprisingly, in the time after the terrorist attack calls for medical assistance increased substantially and significantly more mobile intensive care units were dispatched.

4 | DISCUSSION

This review sought to examine the impact of strike action on healthcare delivery. Overall strike action had a significant impact on healthcare delivery, impacting a range of services and restricting access to care. Both presentations and admissions decreased during strike action and while they increased post-strike, the evidence suggests that if anything, admissions, and presentations post-strike are equal to or lower than pre-strike levels. Evidence also suggested that strike action can disrupt a range of other services such as outpatient appointments, laboratory tests and radiological procedures among others. In saying this, strike action has a differential impact on healthcare delivery, that is, not all services were equally impacted. One of the more interesting findings was that wait times decreased during strike action. While this could be because of a number of factors, for example, less patients attended during the strike, this was replicated across several studies with evidence for this coming from New Zealand, South Korea and Spain, where senior clinicians staffed emergency departments during junior doctor strikes.[23,24,26,41,47,48] This suggests that the impact of strike action is context dependent and its impact depends on the services that remain functioning and the staff on strike amongst other things. We can see this elsewhere when looking to the upstream impacts of strike action, while for some strikes, surrounding services were able to cope with an increased volume of patients, many services were not.[57] On this point, it is worth mentioning Daga and Shende,[42] whose study appears to be an outlier in terms of admissions, which increased during the strike period and decreased in pre and post-periods. This may be explained by the fact that this facility took several measures to reduce the impact of strike action, including training and appointing staff to cover the strike period. The results are also cause for some caution if trying to assess the extent to which a strike will be disruptive; we should also be careful to put this down to a singular cause, strikes are not necessarily disruptive because doctors go on strike, or because they occur in a low and middle income country for example, it appears that a range of factors contribute to the extent to which strikes impact healthcare delivery and that these influence one another. For example, well-planned contingency measures may be enough to mitigate against any negative effects of strike action, even if this action is protracted, as was the case with Daga and Shende.[42] In saying this however, further analysis was particularly difficult for three major reasons, the heterogeneity of outcomes reported in the literature, the variably in the strikes reported and the fact that the details of these strikes were often not reported consistently across studies, something which will be discussed below in our limitations.

A further goal of this review was to shed light on the impact of strike action on surrounding health services that continued to work through a nearby strike, or what was labelled the 'upstream' impacts of strike action. Hospitals that dealt with these upstream impacts often saw increase in presentations at hospitals and a change in how people accessed services. Three studies from Kenya speak to this point, suggesting that services were significantly and adversely impacted because of a strike, in many cases, with demand exceeding hospital capacity.[25,56,57] Outside of hospital, the evidence suggests that some people may not seek care during strike periods, however this may be an overgeneralisation; other studies suggest that parents with children did not delay seeking care and that if other services were available elsewhere, people would often seek care there. The introduction of a fee (for private clinics run by striking doctors in Israel) also appeared to influence whether people sought care, with consultations rates dropping substantially during the Israel doctors strike, for example.

Finally, this review also sought to understand the implications for access to care, patient safety and for healthcare workers considering strike action. On the first point, access to care, this review puts beyond doubt the fact that strike action is disruptive, impacting a range of services, from emergency presentations, hospital admissions and outpatient services. This is perhaps unsurprising, however an important takeaway from this review is that services are not impacted equally. For example, a number of studies suggest that during junior doctor strikes emergency department can become more efficient on a number of metrics (e.g. waiting time) with more senior staff on the frontline. It is also noteworthy that in many cases, emergency services were able to be maintained or contingencies put in place to continue to deliver care with minimal disruption. On the second point, patient safety, it is difficult to comment on all elements of patient safety with the findings from this review alone, however and with the evidence noted in the

introduction about patient morbidity[6] and mortality[7] during strike action, this body of evidence suggests that while disruptive, strikes can generally be conducted safely. There are of course several caveats, notably the more general limitations related to this evidence and the fact that strike action can come in a range of forms and have vastly different impacts on services. This is particularly important to consider in countries where resources are limited, several studies reported significant upstream impacts of strike action. Our final aim was to shed light on these issues for healthcare workers considering strike action. On this, healthcare workers should carefully consider their role, the nature of the strike and the context in which it is occurring, as these amongst several other factors will determine the impact that the strike has.

There are several limitations that should be discussed in relation to this review. The first relates to the heterogeneity of outcomes reported in the literature and the limited details that were reported in the literature. This made it particularly difficult to make any further comparisons. For example, we explored whether the country of the strike or the profession on strike (i.e. doctors, nurses or others) impacted outcomes. Even if we took the most reported outcome however (number of presentations/admissions) and even if we recategorised our data (for example, folding countries into high and low and middle income countries), we still only had three countries that were low and middle income that reported this outcome. Other variables that were also potentially interesting were often poorly reported, for example, only a few studies reported details about the nature of the strike in question in any comprehensive fashion; the numbers of staff who went on strike, the services this effected and the contingencies put in place to deal with the strike. We found similar issues in trying to compare the impact when different professions went on strike, while we did find a pattern when it came to junior doctor strikes (with wait times decreasing in most studies), because of the vastly different nature of the strikes in question and outcomes reported, we could not make any further comparisons. Other studies that have examined strike action have had similar difficulties, but also found that variables such as country, profession and other variables related to the nature of the strike had little impact of patient outcomes.[7] Throughout and perhaps because of this, we found a number of results that are perhaps unexpected, for example, while we might expect rural services to fare worst in low and middle income countries this was not always the case. Daga and Shende[42] reported few adverse effects of strike action in a clinic in rural India. This study also detailed the substantial effort put into arranging contingencies to cover while staff were on strike. Finally, while this review includes 43 papers, because of the diversity of outcomes and the overall lower quality of evidence, care is needed in interpreting these results.

5 | CONCLUSIONS

Perhaps unsurprisingly strike action causes significant disruption within healthcare settings. The impact that this has however is largely context dependent, for example, the professionals on strike, the contingencies put in place during a strike and the ability of the healthcare system to weather the disruption. There is relatively little evidence about how strikes impact how people seek care. The evidence does suggest that in some cases people may not seek treatment during strike periods, but also that in other cases, for example, parents with children may not delay seeking treatment. There is clearly scope for further research in this area to shed light on these questions and others. Given the strain that COVID-19 has placed on healthcare workers across the globe, strike action appears increasingly likely into the foreseeable future, the need for such research is as pressing as ever.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

ETHICS STATEMENT

As this paper reports on a scoping review, ethical approval was not required.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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