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# Group Practice Impacts on Patients, Physicians, and Healthcare Systems: A Scoping Review

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Group Practice Impacts on Patients, Physicians, and Healthcare Systems: A Scoping Review

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# ABSTRACT Objective: To

Objective: To identify the advantages and disadvantages that group practices have on patients, physicians, and healthcare systems.

Study design: A scoping review was performed based on the methodology proposed by Arksey and O'Malley, and refined by Levac and colleagues. Titles and abstracts were screened by two reviewers. A quantitative analysis was performed to assess the type, year, and region of publication as well as the population studied. A qualitative descriptive analysis was performed to identify common themes.

Study setting: MEDLINE, EMBASE, and Cochrane databases were searched for papers which assessed outcomes relevant to the research question.

Results: Our search strategy returned 2408 papers and 98 were included in the final analysis. Most papers were from the United States, were surveys, and assessed physician outcomes. Advantages of group practices for patients included improved satisfaction and quality of care. Studies of physicians reported improved quality of life and income, while disadvantages included increased stress due to poor interpersonal relationships. Studies of healthcare systems reported improved efficiency and better utilization of resources.

Conclusions: Group practices have many benefits for patients and physicians. Most data was of relatively low quality, however, and further work needs to be done assessing patient outcomes. Strengths and limitations of this study:

This was a large, comprehensive overview of group practices from many countries

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- The scoping review methodology allowed us to assess a wide variety of papers and identify key gaps in the knowledge for further study
- Patient engagement was instrumental on focusing this review on patient outcomes and areas for improvement
- This review was limited by language restrictions, heterogeneity of the data, and possible publication bias on blas

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## **INTRODUCTION**

Group practices have existed for over 100 years with one of the first groups set up by the Mayo brothers in the mid-1880s<sup>1</sup>. This group was eventually transformed into a large organization that has been recognized as a center of excellence leading to benefits for patients and physicians. Following their success, group practices became more and more common, and currently, many physicians around world are practicing within groups or partnerships<sup>2–5</sup>. Sizes of group practices vary dramatically, from 2 physicians to over 100 physicians, and there is no standard definition of what defines a group. Over the years many papers have been published on group practice formation assessing various advantages and disadvantages for patients, physicians, and healthcare systems as well as the impetus behind their development. The economic benefits of these groups and the improvements in service provision to patients is supported by the literature and has been well documented<sup>3,6–8</sup>. Barriers to the formation of group practices, or conflicts that can result from group practices have also been considered and often have to do with interpersonal relationships<sup>9–12</sup>. The extent of literature spans many decades and provides an excellent overview of how group practices have evolved and the effects which they have had on patients, physicians, and healthcare systems.

Patient care can be significantly altered by the formation of group practices, and it is important to consider this impact as groups are often formed for reasons that are not directly related to patient care<sup>11,13–15</sup>. Some of these other reasons include the benefits realized by physicians with regards to income, quality of life, satisfaction, and decreased physician burnout, which is estimated to affect more than half of physicians <sup>9,16–19</sup>. Group practices also may be developed due to healthcare system incentives, or as a way to improve the income and efficiency of physicians within a given system<sup>14,20–23</sup>. This again may not be directly related to patient care

but may have impacts on the quality of care and its timeliness. Whatever the motivation for forming group practices, it is important to assess the effects on all involved stakeholders to ensure that this is a step in the right direction for the patients that we are committed to serve, the wellbeing of physicians, and the sustainability of the systems which we work within.

There has been a paucity of literature that synthesizes the knowledge published regarding group practices. A systematic review published in 2013 assessed the effectiveness of group versus solo practice amongst general practitioners (GPs) and demonstrated a positive association between group practices and clinical processes, physicians opinions, and innovation, but did not observe any effect for patient measures<sup>7</sup>. A recent review has also attempted to establish a definition for group practices and the overall shift towards their development<sup>24</sup>. The objectives of this study were to review the literature for evidence that assesses the advantages and disadvantages that group practices have on patients with regards to quality of care and satisfaction; physicians with regards to team dynamics, income, and satisfaction; and the financial impact on healthcare systems. A scoping review was performed as we expected to identify heterogenous studies with a wide range of outcomes focused on patients, physicians, and healthcare systems. A broad overview of the literature was desired to identify current knowledge gaps and guide further studies.

## METHODOLOGY

A scoping review was performed according to the methodology proposed by Arksey and O'Malley, and refined by Levac and colleagues<sup>25,26</sup>. The PRISMA extension for scoping reviews (PRISMA-ScR) checklist was used to ensure all relevant aspects of a scoping review were included<sup>27</sup>. The following research question was developed:

What advantages and disadvantages do group practices have for patients, physicians, and healthcare systems?

A complete scoping review protocol was developed and published<sup>28</sup>. The following stages were incorporated into this scoping review according to what is suggested by Levac et al.: identifying the research question; identifying relevant studies; study selection; charting the data; collating, summarizing, and reporting results; and consultation. Full details on each stage can be found in the published protocol<sup>28</sup>. Briefly, MEDLINE, EMBASE and Cochrane Central were searched to identify relevant studies that assess the impact of group practices on patient care, satisfaction, and outcomes; physician quality of life, satisfaction, and income; and healthcare system finances. There were no restrictions placed on publication date. The grey literature was not searched as originally indicated in the protocol due to an adequate number of peer-reviewed articles which met inclusion criteria from the databases. The search strategy was peer reviewed according to the formal process outlined by McGowan et al<sup>29</sup>. The search strategy is included in Appendix A.

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Three members of the research team met to perform a calibration exercise and review 10 papers to pilot the screening and full text data extraction forms. Titles and abstracts were subsequently screened independently by two reviewers and the abstraction results from the full text articles were charted and verified by the same two members. Disagreements were resolved by discussion between the two reviewers as well as input from other authors of the paper. We included papers that:

- Included patients receiving, and/or clinicians providing care within any type of group practice (Population)

- Assessed the advantages and/or disadvantages of group practices (Concept)

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We examined all papers from group practices in all areas of medicine which reported outcomes relevant to patients, clinicians, or health system stakeholders (Context)
Papers were excluded if they were not published in the English language.

DistillerSR (Evidence Partners, Ottawa, Canada) was used for screening and data extraction. A standardized form was created and tested on 10 papers by three members of the research team. We did not deviate from the protocol and charted authors, year of publication, country of origin, objectives, type and size of group practice, population studied (patients, physicians, etc.), sample size, methods and type of study, interventions, outcomes, and key findings<sup>28</sup>.

We extracted and summarized included paper characteristics including type of study, year, region of publication, and the population studied. A qualitative analysis was also performed using a qualitative descriptive approach from the key findings of the selected papers<sup>30</sup>. This was performed in parallel by two reviewers who then met to discuss the results and corresponding themes. After a conventional content analysis, common themes were grouped by:

1) patient care, including satisfaction and quality of care

2) physicians, including quality of life, competency, group dynamics, group characteristics, and financial impacts

3) healthcare system issues relating to financial impacts

A detailed quality assessment was not performed due to the heterogeneity of the data and the general principles of a scoping review<sup>26</sup>. During the scoping review process, we consulted with members of other group practices to ensure that the review was comprehensive and that all relevant papers were included.

Patient and Public Involvement

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A patient advisor was recruited from the Department of Patient Relations as part of the research team. As practice organization directly impacts on patients, it was essential that we had patient input into the design of the study and the analysis of the data. The patient advisor ensured that the research question and outcomes were applicable to patients and reviewed the final draft of the paper.

## RESULTS

Using the search strategy outlined in Supplementary Appendix A, 2408 papers were identified. Of these, 35 were excluded as duplicates and 2373 titles and abstracts were screened. After screening, 149 full text articles were examined and 98 met inclusion criteria. Of those excluded, 34 did not assess advantages or disadvantages of group practices, 5 papers focused on multidisciplinary groups, 2 papers were based on a previous paper and did not provide any new data, and 1 paper assessed a dental group practice. We were unable to obtain full text articles for 9 papers. The PRISMA flow diagram in Figure 1 displays these results.

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The majority of papers were from the United States (58%), followed by Europe (19%), and then Canada (15%). There were only a handful of papers from elsewhere in the world (7%). Papers frequently included more than one type of group practice. Family medicine was reported on most commonly (76%), followed by surgical practices (43%), and all others (36%). Physicians (94%) were the focus of almost all the papers rather than patients (26%), allied health (4%), or healthcare systems (10%). Some papers touched on multiple populations. Most of the included papers were surveys (63%). There were very few higher quality papers available which focused on group practices. Group practices have been published on dating back until at least the 1960s. Recurring themes were evident over the years and are expanded on in the qualitative analysis. See Table 1 for a full description of included papers.

# Table 1 - Selected Paper Characteristics

Characteristic		Frequency
Region of Study	United States	57%
	Europe	20%
C	Canada	16%
	Other	7%
Type of Group Practice	Family Medicine or General Practitioner	76%
	Surgical	43%
	Other	36%
Population Studied	Physicians	94%
	Patients	26%
	Healthcare Systems	10%
	Allied Health	4%
Type of Publication	Survey	63%
	Letter	7%

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	Case Report	6%
	Cohort Study	5%
	Abstract	2%
	Case Series	2%
	RCT	2%
0	Systematic Review	2%
	Other	10%
Publications by Decade	1960-1969	6
	1970-1979	9
	1980-1989	5
	1990-1999	9
	2000-2009	23
	2010-present	40

# Group Practices Improve Patient Satisfaction and Experience

Sources that addressed patient outcomes are listed in Supplementary Appendix B. Six of these provided evidence that group practices can result in improvements in patient satisfaction<sup>23,31–34</sup>. Most of these sources were surveys that assessed changes in satisfaction after the implementation or expansion of a group practice. This sense of satisfaction appeared to be

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most commonly due to better perceived access to care and quality of care. In contrast to this, one survey from 1975 identified a negative effect on patient satisfaction and experience<sup>35</sup>. The Patient Perceptions of Integrated Care survey identified that patients with multiple chronic diseases who perceive a higher level of integration within a group will utilize less emergency department and outpatient resources<sup>36</sup>.

## Patient Quality of Care

The aspects of quality of care assessed by the papers included access to care, continuity of care, prescribing techniques, adherence of the physicians with established clinical guidelines, frequency of consultations, and unnecessary investigations and treatment. Most sources either identified an improvement in patient quality of care associated with group practices or a negative impact on patient quality of care. Some sources did not identify any differences in patient quality of care based on practice organization<sup>37,38</sup>.

## Group Practices Improve Patient Quality of Care

Twenty-two sources demonstrated improvements in patient quality of care. This included objective measures with quality of care scores as well as patient perception as captured by surveys. Group practices were found to improve access to care, comprehensiveness, waiting times, time spent with patients, efficiency, patient safety, and utilization of resources according to patient reported outcomes<sup>6,8,46,47,32,39–45</sup>. Patients perceived a higher quality of care with group practices with regards to tangibles (equipment and facilities), reliability, responsiveness, assurance, and empathy<sup>48</sup>. Physicians in group practices had higher quality of care scores and adherence to guidelines was found to be better due to increased knowledge sharing and access to information<sup>34,41,49,50</sup>. Improvements in appropriate prescribing techniques were also associated with physicians working in group practices<sup>7,51</sup>. Physicians in group practices were also more

likely to consult peers<sup>52</sup>. More patient-centered medical home processes within a practice is associated with larger groups compared to solo and small group practices (1-2 physicians), although all types of practices have shown modest increases over time<sup>53,54</sup>. However, a recent paper based on large surveys found no improvements in quality measures based on practice size<sup>55</sup>.

## Group Practices Negatively Impact Patient Quality of Care

Six sources noted some negative impacts with group practices on patient quality of care. This included worse continuity of care and dilution of the patient-doctor relationship<sup>47,56</sup>. Group practices have also been found to order more investigations or treat inappropriately if there was a financial benefit<sup>8,57,58</sup>. Additionally, a primary care internist who moved from a small practice to a large group practice after many years perceived that the level of care he was providing was compromised by the large group and payers setting targets for the group<sup>59</sup>. BMJ Open: first published as 10.1136/bmjopen-2020-041579 on 8 January 2021. Downloaded from http://bmjopen.bmj.com/ on April 17, 2024 by guest. Protected by copyright

# Physician Quality of Life, Satisfaction, and Burnout

Papers which assessed physician outcomes are listed in Supplementary Appendix B. Twenty papers assessed the relationship between group practices and physician quality of life, satisfaction, and burnout. Two main themes were identified from the sources. Two papers did not find any significant difference in this area for group and solo practices<sup>60,61</sup>.

## Group Practices Improve Physician Quality of Life and Satisfaction

Group practices were often found to improve the work-life balance and job satisfaction for physicians when compared to solo practices<sup>9,19,62–66</sup>. Being a member of a group practice led to less professional isolation, improved knowledge sharing, and an improvement in professional development<sup>9,19,67</sup>. Improved attitudes about group practices in the Netherlands were related to an increased desire for contact and cooperation with other physicians<sup>68</sup>. Satisfaction with

personal and lifestyle factors and optimism for the future was increased amongst physicians in group practices<sup>69,70</sup>. Group practices were also associated with a decreased call burden and increased cross coverage of patients which directly impacts the quality of life for most physicians and their families<sup>6,67</sup>. Due to the aforementioned benefits, group practices have also been noted to improve retention and recruitment initiatives, especially in rural or underserviced areas<sup>67,71</sup>.

## Group Practices Lead to Conflict and Additional Stress for Physicians

Seven sources have identified issues with group practices that create conflict and additional stress for physicians. These center around the interpersonal relationships of the group members and sustainability<sup>62</sup>. Poor interpersonal relationships lead to lower job satisfaction and a higher degree of professional burnout<sup>72,73</sup>. Some group practices were also associated with increased physician demands, decreased performance, and reduced autonomy<sup>73–75</sup>. A large survey of family physicians in Canada found that physicians in solo practice had more job satisfaction than those in group practices in a survey that was primarily assessing improved satisfaction with performing procedures<sup>76</sup>.

### Group Practices Improve Physician Competency

Two papers addressed differences in physician competency. Family physicians and surgeons were found to be less likely to pass their respective maintenance of certification exams if they were in a solo practice. This was thought to result from the ability to spend more time on quality improvement and education within a group practice<sup>77,78</sup>.

### Facilitators and Barriers Associated with Working in a Group Practice

An important theme that arose during analysis was the identification of barriers and facilitators associated with forming or maintaining a group practice. These characteristics have

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sources identified these characteristics and they are summarized in Table 2.

Table 2 - List of Barriers and Facilitators for Group Practices

Facilitators	Barriers
Teamwork	Incompatible personalities
Leadership	Poor leadership
Common vision	Different visions for the group
Patient centred care	Disagreements about re-imbursement
Quality improvement	Legal and real estate issues
Accountability	Dissatisfied office staff
Sense of ownership	Fears about loss of autonomy
Sense of responsibility	2.
Cohesiveness	R.

# **Financial Impacts for Physicians**

Although there are some geographical variations based on different healthcare systems, some common financial themes can be seen in the literature (Supplementary Appendix B).

# Group Practices Lead to Higher Incomes for Physicians

Sources from the United States, Taiwan, and South Africa have identified increased individual earnings for physicians practicing within group practices<sup>15,21,70,79–82</sup>. Physicians in group practices have also been shown to be more satisfied with their compensation. A letter published in 1968 highlighted income deferral by physicians until later in life when they were less productive as an additional benefit of group practices<sup>83</sup>. Currently, larger groups may be

forming in the United States as they are able to leverage insurers more effectively and build up more market share<sup>3</sup>.

# Costs of Group Practices are Higher than Solo Practices

Costs of group practices have been found to be higher than those of solo practices<sup>20,84,85</sup>. This may be due to more investment in technological costs that solo practices would not be able to afford<sup>20,85</sup>. Some large group practices may also be more inefficient than solo or small group practices<sup>86</sup>.

Group Practices May Improve the Uptake of Health Information Technology

Physicians practicing in groups are more likely to have greater access to health information technology (HIT) and were also more likely to correspond with their patients and other providers via email<sup>7,87</sup>. Family physicians in the United States in solo practices were found to be less likely to adopt electronic health records when compared to those in group practices<sup>88,89</sup>. Data from two large surveys indicated a general trend towards increased use of HIT over time, but did not see a clear association between group size and an increased use of HIT<sup>55</sup>.

# More Physicians are Practicing in Group Practices and Group Practices are Increasing in Size

Many sources have tracked the rise in the number and type of group practices over the years (Supplementary Appendix B). The definition of a group practice is very heterogenous in the literature and previous work has been done in an attempt to classify groups<sup>24</sup>. Often, groups of 1-19 physicians are classified as small or medium (further subclassified into groups of 1-2, 3-7, 8-12, and 13-19), and groups of 20 or more are classified as large (further subclassified into groups of 20-99 and >100).<sup>53,54</sup> The included papers show an increase in the absolute number of group practices and their sizes over the years.

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In 1968, group practices were mostly limited to hospitals with most other physicians working in solo practices outside of the hospitals, and it was believed that group practices would not be taken up unless it was established as a desirable form of practice to society and health care professionals<sup>90,91</sup>. Now, in the United States, more physicians across all specialties are forming or joining larger groups and groups of more than 100 physicians which usually have non-physician owners, have grown rapidly in recent years<sup>2–4</sup>. This increase has been driven by the benefits group practices can offer physicians<sup>11,13,92–95</sup>.

Despite having a very different healthcare system, group practices have also grown in Canada. In 1970, 57% of graduating physicians entered a group practice or partnership, 21% entered solo practice, and 22% became salaried physicians. Surgeons and psychiatrists were most likely to enter solo practice<sup>5</sup>. A survey of Canadian physicians in 1987 found that around half of the physicians were in either solo or group practices and the other half had some group practice arrangements for financial benefits<sup>14</sup>. Government support was seen as a key factor in establishing group practices<sup>14,96</sup>.

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Group Practices May Help Reduce Costs Within Healthcare Systems

Group practices have the potential to impact healthcare systems financially, with respect to access to care, and appropriate utilization of healthcare resources. Sources have shown that group practices of all sizes and most specialties have been shown to have more technical, cost, and profit efficiencies than solo practices (Supplementary Appendix B)<sup>97,98</sup>. This is thought to be due to the standardization of processes<sup>98</sup>. Group practices that focus on improved screening and monitoring may improve avoidable utilization, cost, and revenue<sup>97</sup>. A higher level of integration perceived by patients with chronic illnesses also reduces utilization of emergency department and outpatient resources<sup>36</sup>. Income pooling within an obstetrical call group in a Canadian study

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led to decreased rates of elective induction of labour in a before and after study<sup>99</sup>. Older data from the Physicians' Practice Cost and Income Survey in 1986 found no significant differences in practice efficiency between solo and group primary care practices in the United States<sup>100</sup>. Additionally, a recent paper which included data from large surveys found that group size was not associated with an improvement in spending or quality<sup>55</sup>.

## DISCUSSION

We were able to identify themes associated with the advantages and disadvantages that group practices have for patients, physicians, and healthcare systems. It is important to note that the term 'group practice' refers to a broad range of practice types within the literature and there is no clear definition with respect to the critical pieces that define what a group practice is beyond the number of physicians and inclusion of one or more specialties. Organizations in the United States such as the America's Physician Groups, and American Medical Group Association have been developed to represent physicians in various types of groups. Groups may be defined as single specialty with two or more physicians or multispecialty with any number of different specialties providing care to patients.

Themes involving patients included satisfaction and quality of care. Generally, patients seemed to be more satisfied with care that was being received from physicians in group practices<sup>23,31,32,46</sup>. From these studies, this appears to be due to increased access to care and decreased waiting times. Although continuity of care would seem to be a legitimate concern with a group practice as patients may be seeing different physicians on any given day, this was actually shown to be improved in one study<sup>23</sup>. Furthermore, in a situation that is unique to a surgical group practice, patients did not seem to be concerned by the fact that they might not

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meet the surgeon who is operating on them until the day of their operation as they had confidence in any of the surgeons associated with the group<sup>32</sup>.

While it is important that patients are satisfied with the care they are receiving, it is imperative that they also receive high quality care. Overall, most papers indicated that the quality of care increased with a group practice structure as measured objectively and subjectively. Adherence to guidelines and appropriate prescribing was better with group practices and quality of care scores improved<sup>7,50,51</sup>. There were some notable exceptions including using radiation therapy for prostate cancer when it was not necessarily indicated because the group owned radiation facilities, and the increased use of laboratory investigations offered by the group<sup>15,57,58</sup>. This may have been driven by convenience as well as financial gain.

Overall, patients appear to benefit from group practices through improved quality of care, access, and satisfaction. The data surrounding the impact of group practices on patients was presented in 24 percent of papers. This has been identified as an area for further research as we know that group practices are often formed to primarily benefit the physicians working within them<sup>6,67,71</sup>.

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Numerous advantages of group practices for physicians have been identified from this scoping review. They include increased quality of life and satisfaction, decreased burnout, higher competency, and financial gain. More attention has been paid to physician burnout in recent years as the prevalence is surprisingly high<sup>17,18</sup>. Improving the quality of life and job satisfaction for physicians may help with this and group practices have the potential to help in these areas.

Overall, most of the literature included in this review shows a positive association with group practices and physician quality of life and job satisfaction. These improvements result from a better work-life balance, shared call responsibilities, improved knowledge transfer,

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collaboration, and decreased professional isolation<sup>6,9,62,65</sup>. Physicians in solo practices may still be able to pursue similar opportunities but may face logistical challenges due to isolation.

A notable area of decreased satisfaction results from poor interpersonal relationships<sup>12,22</sup>. This can lead to the collapse of a group and highlights the need for group practice members to be compatible and share a common vision, especially if they are financially integrated. As groups become larger and larger, especially in the United States where groups of more than 100 physicians are not uncommon, relationships can become less collegial and autonomy may be lost<sup>101</sup>. The importance of regular meetings with a shared sense of ownership and responsibility has been shown to be very important to group function and quality of care<sup>102,103</sup>. Therefore, although groups have the potential to improve job satisfaction and quality of life for physicians, it depends on the overall functioning of the group and compatible personalities within the group for this to be achieved.

In the two papers assessing the level of physician competency (based on whether or not physicians were members of group practices) the overall impact seems to be positive with improved scores on certification exams<sup>77,78</sup>. This is thought to be due to more knowledge transfer between group members and less professional isolation. The ability to approach and consult colleagues relatively easily about difficult or interesting clinical questions has the potential to enhance the learning of all group members and improve patient care.

Financially, group practices have been shown to improve incomes of physicians. This is most relevant in the United States where groups are often formed to gain negotiating leverage with payers<sup>11,13</sup>. However, individual incomes also seem to be higher in other areas of the world such as New Zealand, South Africa, and Taiwan<sup>70,80,81</sup>. The increased income may help offset

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costs associated with investments in equipment or technology that would not be feasible for solo physicians.

The impact of group practices on healthcare systems can be seen in improvements in access to care, system efficiencies, improved use of resources, and adherence to guidelines. Some exceptions to this may include inappropriate use of resources if there is a financial gain. Moving forward, this will be an important area of study as there are many different health care systems in place around the world.

As part of the scoping review process, key stakeholders were consulted regarding this review. They included a patient advisor and members of other group practices. The patient advisor was included in the design of this study and verified the results. Other group practice members verified the results and will help to guide further research in the future. Some of the authors of this paper are group practice members and will be using their practice for research that will focus on patient outcomes including quality of care and satisfaction, as well as physician outcomes including quality of life, satisfaction, and burnout with guidance from this scoping review.

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There are inherent limitations with a scoping review. This was meant to be a broad overview of the available literature and as such, the data is heterogenous and does not lend itself well to a quality assessment. Most of the included papers were surveys and of lower quality. There may very well be a publication bias with this topic as authors may only be inclined to publish on group practices that have worked very well. The included papers were also from many different regions and therefore, the conclusions may not be applicable to a particular country or region, however the objective of this review was to assess the advantages and

disadvantages of group practices and common themes were identified that likely transcend many regional differences.

# CONCLUSION

A group practice structure has many advantages for patients and physicians alike. Although the data is somewhat limited for patients compared to physicians, this scoping review has shown that there is a generally positive patient experience with some evidence of improved quality of care. There is also an increase in physician satisfaction and quality of life in groups that function well with compatible personalities. This scoping review has summarized the available literature based on our research question and has allowed us to identify two interesting areas of future investigation. First, it will be important to define exactly what the critical elements of a group practice are beyond the number of physicians as there is no standard definition that we were able to discern in this scoping review. This may then be used to guide the development of functional groups that are able to improve care and quality of life for both patients and providers. Second, although most of the available literature is directed towards the impact of group practices on physicians, addressing patient outcomes and perspectives is essential. This has been addressed in the literature more recently, and is an area which should be further developed.

# CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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# CONTRIBUTORS

HM, TZ, DM, and FB conceived the study. TZ and HM drafted the protocol and developed the research question. TZ and SA performed the title and abstract screening and full text data extraction. TZ, HM, JB, TW, and SR contributed to the thematic analysis and interpretation of the data. All authors read and approved the final manuscript. HM is the guarantor.

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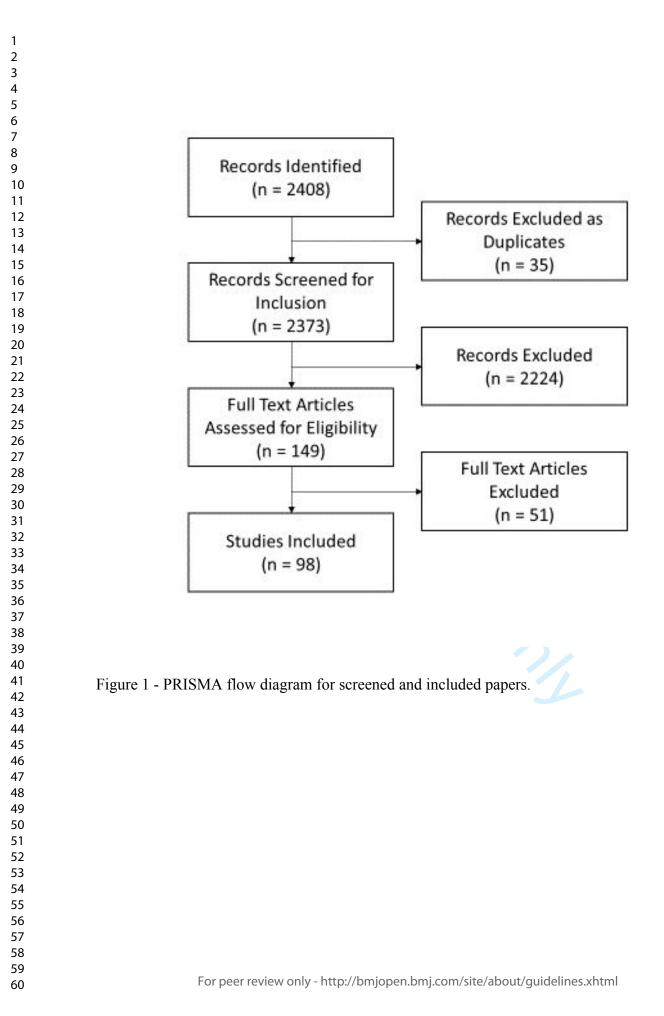
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Database: Embase Classic+Embase <1947 to 2018 October 20>, Ovid MEDLINE(R) Epub Ahead of Print, In-Process & Other Non-Indexed Citations, Ovid MEDLINE(R) Daily and Ovid MEDLINE(R) <1946 to Present> Search Strategy: \_\_\_\_\_ Group Practice/ (16988) (group practice\* or group medical practice\* or group model or group models).tw. (14652) 1 or 2 (26886) physicians/ or allergists/ or anesthesiologists/ or cardiologists/ or dermatologists/ or endocrinologists/ or gastroenterologists/ or geriatricians/ or nephrologists/ or neurologists/ or oncologists/ or radiation oncologists/ or ophthalmologists/ or otolaryngologists/ or pediatricians/ or neonatologists/ or pulmonologists/ or radiologists/ or rheumatologists/ or surgeons/ or neurosurgeons/ or orthopedic surgeons/ (443392) (allerg\* or an?esthesiolog\* or cardiolog\* or clinician\* or dermatolog\* or endocrinolog\* or gastroenterolog\* or geriatrician\* or gerontol\* or gyn?ecolog\* or h?ematolog\* or nephrolog\* or neurolog\* or obstetric\* or oncolog\* or ophthalmolog\* or otolaryngolog\* or patholog\* or p?ediatrician\* or neonatolog\* or physiatr\* or pulmonolog\* or orthop?ed\* or radiolog\* or rheumatolog\* or surgeon\* or neurosurgeon\* or urolog\* or general practitioner\*).tw. (5716273) general practitioners/ or physicians, family/ or physicians, primary care/ or Primary Health Care/ (224656) (general practitioner\* or family physician\* or primary care physician\*).tw. (170297) physician\*.ab. /freq=3 (121030) or/4-8 (6177351) 3 and 9 (7625) (group physician\* or group surgeon\*).tw. (683) 10 or 11 (8258) income/ or exp pensions/ or remuneration/ or exp "salaries and fringe benefits"/ (144814) prognosis/ or exp treatment outcome/ (3037613) "Outcome Assessment (Health Care)"/ (306264) personal satisfaction/ or job satisfaction/ (99372) exp Patient Satisfaction/ (191942) (satisfaction or patient reported outcome\*).tw. (275754) "Quality of Life"/ (522787) "quality of health care"/ or quality assurance, health care/ (297926) (income or salary).tw. (205853) Life Style/ (134714) life style.tw. (24521) lifestyle.tw. (167173) quality.mp. (2447101) Stress, Psychological/ (166129) Burnout, Professional/ (18655) (burnout or stress).tw. (1383633) perception of care.tw. (479) models, organizational/ (62847) organi?ation\* model\*.tw. (2367) Physician-Patient Relations/ (177062) (patient adi2 physician adi3 relation\*).tw. (7804) (revenue\* or profit or profits).tw. (52523) insurance, health, reimbursement/ or reimbursement mechanisms/ or reimbursement, incentive/ (73589) or/13-35 (7492929) 12 and 36 (3422) group practice\*.ti,kw. or (group medical practice\* or medical group practice\*).tw,kw. (4213) ("in data review" or in process or "pubmed not medline").st. (2785791) 38 and 39 (62) 37 or 40 (3481) For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

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## Supplementary Appendix B

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Supplementary	BMJ Open 2020-041579 on 8			
Table 1 - Paper	rs Assessing Pat	ient Outcomes	79 on 8	
Author	Study Design	Population Studied	Key Findings	
Sellers, 1965	Retrospective	Patients	More laboratory investigations and consultations for group practice patients	
	cohort study	Physicians	and patients report more personal attention and in-depth explanations of a	
		De	diagnosis and treatment by physicians in solo practice $\frac{1}{2}$	
Graham,	Review	Physicians	Limited evidence shows improvement in accessibility, continuity, quality, and	
1972			efficiency with group practices. Potential drawbacks included dilution of the	
			doctor-patient relationship and less autonomy.	
Ritchey, 1975	Survey	Patients	Patients with solo GPs have better relationships with their physicians. Patients	
			with GPs in group practice have greater unmet needs.	
Roos, 1980	Retrospective	Physicians	Quality of care and productivity were not found to be different for physicians	
	Cohort study		in solo vs group practices in Manitoba.	
Cohen et al.,	RCT	Patients	Patients were randomized to a new group practice model and found no	
1986		Physicians	changes to patient satisfaction but there was a decreased in charges and	
		Allied Health	utilization for patients as well as improved access to $care, and decreased$	
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			BMJ Open
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			waiting times.
Kuyvenhoven	Survey	Patients	GPs in the Netherlands were surveyed and 20% of solog physicians stated th
et al., 1990		Physicians	they never consulted their peers, while those working $\frac{\infty}{2}$ a group practice di
			so regularly, which was found to help improve the level of attention paid to
		K.	somatic complaints.
Gawande &	Survey	Patients	Patient satisfaction increased following the expansion $\frac{1}{2}$ a group practice fr
Benroth,		Physicians	18 to 36 orthopedic surgeons in Indianapolis. This was
1999			decreased waiting times and increased time spent with a surgeon.
Campbell et	Survey	Patients	Solo GP practices have shorter consultation lengths (10.2 min) vs group
al., 2001		Physicians	practices (17.8 min).
		Healthcare Systems	COM/ ON
Lin et al.,	Survey	Patients	Patients perceive better overall quality of care in primary care group practic
2004			compared to solo practices with regards to equipment, sacilities, reliability,
			responsiveness, assurance, and empathy.
Orrantia,	Case Report	Patients	A family group practice that was established in Marathon, Ontario allowed
2005		Physicians	the maintenance of a stable number of physicians and $\frac{2}{4}$ is allowed for
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			increased health care services offered to the community.
Ashworth &	Survey	Patients	Group practices obtained significantly higher Quality and Outcomes
Armstrong,		Physicians	Framework scores in the UK when compared to solo $p_{\underline{F}}$
2006			nuary 202
Breon, 2009	Case Report	Physicians	After the establishment of a surgical group practice in gural Iowa by five
		Healthcare Systems	surgeons the access to surgical care at multiple hospitates improved and shared
			call coverage was achieved.
Gaal et al.,	Survey	Physicians	Larger primary care practices in Europe were found to have more patient
2010			safety features present, but clinical outcomes were not assessed in this paper.
Tourigny et	Survey	Patients	Patient perception of continuity of care increased, accessibility remained the
al., 2010			same, and physician co-ordination with specialists decreased in this before an
			after study following implementation of group practices in Quebec.
Weeks et al.,	Cross-	Patients	Large multispecialty group practices enrolled with the council of Accountable
2010	sectional		Physician Practices delivered better quality of care at 2 lower cost than other
	Study		groups.
Rittenhouse	Survey	Patients	Larger groups used more patient-centered medical home processes than solo
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			BMJ Open
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et al., 2011			2 physician groups.
Landon, 2012	Conference	Healthcare Systems	A primary care internist who moved from a small prace to a large group
			practice after many years found that the level of care $h_{\underline{\beta}}^{\infty}$ was providing was
			compromised by the large group and payers setting targets for the group. $\hat{\aleph}$
van den	Survey	Patients	From a survey of patients seen in a group practice herita clinic, most were
Heuvel et al.,		6	found to be satisfied with any surgeon from the group $\frac{5}{8}$ erforming their
2012			surgery, even if they hadn't met them until the day of surgery, and felt that
			group practice allowed for more efficient use of resources.
Damiani et	Systematic	Patients	GP group practices had positive impacts on prescribing appropriateness
al., 2013	Review	Physicians	compared to solo practices. Other quality measures were found to have
		Healthcare Systems	insufficient evidence in the included papers.
Devlin et al.,	Survey	Patients	Larger family physician group practices were associated with better access
2013		Physicians	care, comprehensiveness, and disease prevention. Continuity of care was
			negatively affected.
Ly & Glied,	Survey	Patients	Large primary care group practices (> 10 physicians) $\frac{3}{2}$ the United States w
2013		Physicians	found to have shorter waiting times by 14 minutes for $\frac{9}{6}$ atients.
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			BMJ Open
			BMJ Open Patients in integrated medical groups received higher quality care based on 6
Mehrotra et	Cross-	Patients	Patients in integrated medical groups received higher quality care based on 6
al., 2013	sectional		quality measures compared to independent practice as sociations. The self-
	Study		reported use of electronic medical records was higher
Perkins et al.,	Survey	Physicians	Obstetricians and Gynecologists in the United States are more likely to adher
2013			to established cervical cancer prevention guidelines if $\frac{\aleph}{2}$ they are part of a group
			practice, possibly because of improved knowledge shaping and access to $\underline{\underline{s}}$
			information.
Pichetti et al.,	Survey	Physicians	In France, those who work in groups were more likely to prescribe multiple
2013			sourced rather than patented statins than solo practition
Visca et al.,	Survey	Patients	No clinically significant difference was found between solo and group
2013		Physicians	practices in the management of chronic diseases by $G_{g}^{\underline{\beta}}$
Wiley et al.,	Survey	Patients	Processes for the patient-centered medical home mode have increased in all
2015		Physicians	group practices sizes over time but are only present in tess than half of even
			large groups. Additionally, a reduction in patient involvement in care was
			noted over time.
Fryer et al.,	Survey	Patients	The Patient Perceptions of Integrated Care survey identified a decrease in
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			BMJ Open
			BMJ Open utilization of emergency department and outpatient resources amongst pati
2017			utilization of emergency department and outpatient resources amongst pati
			with multiple chronic illnesses who perceived a higher devel of integration $g^{\overline{o}}$
			the group practice that delivered care to them. $\int_{\Omega}^{\infty}$
Baker et al.,	Survey	Patients	No significant changes reported in quality measures based on group practic
2018		Physicians	size.
Bardos et al.,	Cohort	Patients	Compared to those in groups, solo obstetricians had a higher Cesarean sect
2018		Physicians	rates but lower rates of shoulder dystocia and third or fourth degree tears
			which was felt to indicate that they had a more conservative approach to
			labour.
Cohidon et	Survey	Patients	Patients in family physician group practices in Switzegand reported a bette
al., 2018		Physicians	experience with continuity and co-ordination of care compared to solo
			practices. No differences were seen in their experience
			communication between the practice types.
Ellis et al.,	Systematic	Patients	In a limited number of studies, patients appeared to be more satisfied with
2018	review	Physicians	specialist group practices rather than solo practices with respect to tangible
			and their own assessment of quality.
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			BMJ Open 60
			BMJ Open In a group practice, there may be differing opinions and risk tolerance amongs
Freemyer &	Case Report	Patients	In a group practice, there may be differing opinions and risk tolerance among
Stoff, 2018		Physicians	members especially with non-adherent patients and potentially dangerous
			medications. In order to minimize the effect on continuity of care, physicians
			in group practices should develop policies around chattenging situations and
			apply these consistently to patients.
Hollenbeck et	Cohort	Patients	Prostate cancer patients were found to be more likely to be with intensity-
al., 2018		Physicians	modulated radiation therapy if the urology group owned radiation facilities
			regardless of group size even if the treatment was unlikely to be beneficial,
			suggesting that the financial incentive outweighed besperactices in prostate
			cancer care and that group practices do not prevent conflicts of interest.
Stol et al.,	Survey	Physicians	Practices that implemented selective prevention for cardiometabolic diseases
2018			were more often group practices rather than solo practices. These practices
			were also organized better for chronic disease management.
Xierali, 2018	Cross-	Physicians	Physicians in group practices were more likely to practice at multiple sites
	sectional		which may increase the access to care for patients.
	study		which may increase the access to care for patients.
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# Table 2 – Papers Assessing Physician Outcomes

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Table 2 Pan	are Assassing Ph	ysician Outcomes	BMJ Open 2020-04157
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Author	Study Design	Population Studied	Key Findings 9
Bailey, 1968	Cohort	Patients	Physicians, rather than patients, benefit the most from multidisciplinary group
		Physicians	practices as their output was lower, fees were higher, and they ordered more
			tests especially if that service was offered by the group
Rose, 1968	Letter	Physicians	Income deferral by physicians until later in life when they were less
		0	productive was viewed as a benefit of group practices.
Terris, 1968	Letter	Physicians	Group practices were mostly limited to hospitals with most other physicians
			working in solo practices outside of the hospitals, and years was believed that
			group practices would not be taken up unless it was established as a desirable
			form of practice to society and health care professionals.
Weinerman,	Letter	Patients	Group practices needed to be refocused on patients in $\frac{6}{5}$
1968		Physicians	societal needs.
Verbeek-	Survey	Physicians	A significant desire for contacts and co-operation with other general
Heida, 1969			practitioners led to improved attitudes about group pragices in the
			Netherlands.
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Mahoney,	Survey	Physicians	Future surgeons preferred solo practice due to the potential loss of autonomy
1973			while future obstetricians and pediatricians preferred $p_{Q}^{\vec{n}}$
			and future internists preferred group practices.
Wallace,	Letter	Physicians	This letter from the secretary-general of the Canadian Medical Association
1974			highlighted the possible need for government support $\bigcup_{i=1}^{N}$ help with the
			establishment of medical groups.
Evashwick,	Cross-	Physicians	Non-metropolitan areas in the United States that have greater percentage of
1976	sectional		group practices have better retention and recruitment rates.
	Study		benjope benjope
Kimbell &	Survey	Physicians	In 1979 in the United States, physician annual gross regenue, total patient
Lorant, 1977			visits per year, and office visits per year were measured and there were
			increasing returns to scale for physicians in solo or small group practice and
			inefficiencies noted in large group practices.
Paulick &	Survey	Physicians	In Canada, 57% of graduating physicians entered a group practice or
Roos, 1978			partnership, 21% entered solo practice, and 22% became salaried physicians
			Surgeons and psychiatrists were most likely to enter $s_{\underline{\alpha}}^{\underline{\beta}}$ practice.
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			BMJ Open 60 j
			BMJ Open 50/bmj.open-202
Davies, 1979	Survey	Physicians	In 1978 in New Zealand, group practices had higher cost than solo practic
Graham,	Survey	Physicians	The Manpower Survey of Oral Surgery was performed and it was reported
1979			that oral surgeons working in group practices had high $\stackrel{\infty}{_{\Xi}}$ incomes and
		$\mathbf{\wedge}$	employed fewer full-time equivalent staff per surgeon
Pasternak et	Survey	Physicians	There was no significant difference in physician satisfaction between thos
al., 1986			practicing in groups vs those in solo practice in the southwest United State
McCormick	Survey	Physicians	GPs in solo practice earn less than those in group practices (gross income
& Thomson,			19% less) due to lower fees and lower numbers of patients seen.
1989			
Holden, 1990	Letter	Physicians	Solo family physician practice in rural areas was in degline and unlikely to
			succeed as group practices were forming and offering better benefits to
			graduating residents.
Williams et	Survey	Physicians	Half of the physicians were in either solo or group pragices and the other
al., 1990			had some group practice arrangements for financial be $\frac{1}{2}$
			hypothesized that future formation of group practices would require some
			incentives from government, which has happened.
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			BMJ Open A unique group practice without walls structure is described which allows for
Schryver et	Case Report	Physicians	A unique group practice without walls structure is described which allows for
al., 1993			the formation of a group with physicians at different locations. The members $g$
			enjoy the business and professional benefits of a group practice, but this still $\exists$
		$\wedge$	allows for autonomy, decentralization, and individual gractice style.
Hays &	Interviews	Physicians	GPs in Australia who were interested in forming group practices were
Sanderson,			completed and identified incompatible personalities or $\frac{\frac{3}{2}}{\frac{3}{2}}$
1994			and real estate issues, and initial costs as barriers.
Connor et al.,	Survey	Physicians	Group practice opportunities are an important aspect in recruiting physicians
1995		Healthcare Systems	to practice in a rural hospital in order to reduce isolation, pool resources, and
			decrease call burden.
Stamps, 1995	Survey	Physicians	Physicians in private group practices were significantly more satisfied with
			personal and lifestyle factors than those in solo, hospited, or health
			maintenance organization related practices.
Defelice &	Survey	Physicians	Data from the Physicians' Practice Cost and Income Survey found no
Bradford,			significant differences in practice efficiency between solo and group primary
1997			care practices in the United States.
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		BMJ Open	
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Hueston,	Survey	Physicians	GPs associated with solo or small group ( $\leq 3$ physicians) practices were f
1998			to be less satisfied.
Dowell et al.,	Survey	Physicians	GPs associated with solo practices were found to be less satisfied than the
2000			in group practices.
Bland et al.,	Cohort	Patients	Income pooling within an obstetrical call group in a Canadian study led to
2001		Physicians	decreased rates of elective induction of labour in a before and after study $\frac{3}{6}$
Romano,	Letter	Physicians	Group practices generally enhanced United States physicians' quality of
2001			improved patient care, improved professional develop
			earnings.
Sturm, 2002a	Survey	Physicians	Data from the Community Tracking Study was used to show that surgeon
			working within a small practice was the greatest predictor of career
			dissatisfaction and that patient quality of care was impacted by income
			pressures as well as decreased continuity of care and clinical freedom with
			solo or 2 surgeon practices.
Sturm, 2002b	Survey	Physicians	Data from the Community Tracking Study found that physicians working
			within a solo or 2 physician practice was the greatest $p_{\underline{a}}^{\underline{a}}$ edictor of career
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			dissatisfaction. They also reported less clinical freedore and constraints on
			income.
Casalino et	Survey	Physicians	Data from the Community Tracking Study was also us
al., 2003		Healthcare systems	frequently cited reason for group practice formation was negotiating leverag
			and barriers included lack of leadership, physician co-operation, and
		- C	investment.
Crane &	Case Report	Physicians	The growth and subsequent deterioration of a large orthopedic group practic
Dennis, 2003		Healthcare systems	which amalgamated multiple smaller groups is described. The eventual
			demise of the practice appeared to be due to poor leadership, disagreements
			over re-imbursement, differing visions for the future of the group, dissatisfie
			office staff who were in danger of being let go due to $\frac{g}{g}$ intralization, difficul
			in negotiations with payers, and being undercut by smaller competing group
Curoe et al.,	Survey	Physicians	Physicians in the United States found that as group practice size increases, the
2003			culture is less collegial, less cohesive, and there is less organizational trust $\frac{1}{6}$
			which was also true for multi-specialty practices compared to single
			specialty.
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Feron et al.,	Survey	Physicians	Physicians working in solo practices viewed improved quality of life,
2003			knowledge sharing, and continuity of care as motivation to form a group $g$
			practice. Interpersonal relationships, budget issues, $\log_{\frac{1}{2}}^{\infty}$ of the patient-
			physician relationship, and differing views of the group were viewed as $\aleph$
			barriers.
Casalino et	Survey	Physicians	Data from the Community Tracking Study was used to assess the reasons f
al., 2004		Healthcare systems	growth of group practices and it was seen that physicians were increasingly
			forming single specialty group practices to not only increase the scope of
			surgical services and diagnostic imaging they could offer, but also gain
			negotiating leverage with payers.
Lin et al.,	Survey	Physicians	In Taiwan, higher incomes were realized by physician who were in single
2006			multi-specialty groups when compared to solo practice physicians. $\exists$
Solberg et al.,	Survey	Physicians	Within a family medicine group in the United States, oategories important
2006			a high level of care included teamwork, leadership, patient centered care,
			quality improvement, accountability, and a sense of ownership.
Liebhaber &	Letter	Physicians	From 1996/97 to 2004/05, the proportion of physician in solo or 2 physici
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			BMJ Open 136/bmjopen-202
Grossman,			practices decreased from 40.7% to 32.5% and physicians were increasingly
2007			forming single specialty rather than multi-specialty group practices.
Lowes, 2007	Survey	Physicians	Primary care physicians in the United States were earning more money if
		$\wedge$	they practiced within groups of more than 50 physicians.
Rivet et al.,	Survey	Physicians	Family physicians in solo practice had greater overall $\frac{19}{90}$ satisfaction in this
2007			survey that primarily assessed improved satisfaction $a_{\underline{s}}^{\underline{s}}$ ociated with
			performing procedures.
Zazzali,	Survey	Physicians	Stronger group culture emphasizing participation, tean work, and
Alexander,			cohesiveness promoted physician satisfaction. Convergely, a hierarchical
Shortell, &			structure had a negative effect on satisfaction.
Burns, 2007			.com/ or
Masselink,	Survey	Physicians	Data from the Physician Worklife Survey found that $g\underline{\underline{\underline{u}}}$ od relationships with
Lee, &			colleagues in a large group practice led to a decrease $ing$ physician's intent t
Konrad, 2008			withdrawal from practice. A similar effect was not see for physicians in
			withdrawal from practice. A similar effect was not seen for physicians in small or solo practices.
Breon, 2009	Case Report	Physicians	After the establishment of a surgical group practice in aural Iowa by five
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I			BMJ Open 36
			BMJ Open 36/bmjopen-202
		Healthcare Systems	surgeons the access to surgical care at multiple hospitals improved and sh
			call coverage was achieved.
Rodríguez &	Case Study	Physicians	A family medicine group in Quebec was assessed during its formation and
Pozzebon,		Allied health	difficulties with interpersonal and interprofessional relationships were
2010		Healthcare systems	identified and found to be quite detrimental to the functioning of the team $\hat{\boldsymbol{\varphi}}$
		6	new director was able to mend these relationships, improve communication
		Ne	and move the group forward.
Streu et al.,	Survey	Physicians	Working within a group practice led to increased job setisfaction for plast
2010			surgeons as they were less professionally isolated.
Koppula et	Interviews	Physicians	Group practices allowed family physicians to have a better work-life bala
al., 2011			collaboration, and support from fellow group members and allowed for
			continuity of care during and beyond the obstetrical events. Some challen
			identified included sustainability (securing locum physicians to cover
			absences) and conflict within the group.
Rao et al.,	Survey	Physicians	Family physicians in the United States in solo practices were found to be
2011			likely to adopt electronic health records when compared to those in group
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			ý rigt

			BMJ Open 60
			BMJ Open 136/bmjopen 202
			practices.
Suchman A	Abstract	Physicians	Chronic conflict, behavioural accountability, and a congimon vision were
et al., 2011			addressed in a small group practice through regular magnitude spectra $\vec{s}$
			objective assessment by allied health professionals to improve group
		$\sim$	function.
Orton et al.,	Survey	Physicians	Higher rates of depersonalization were identified in Ges in the UK working
2012			in group practices vs solo practices which was felt to $b\frac{a}{2}$ due to poor
			interpersonal relationships as well as increased demands and less autonomy
Burns et al.,	Review	Physicians	Currently, part of the reason larger groups in the United States may be
2013			forming is because they are able to leverage insurers not effectively and
			build up more market share. Groups with over 100 physicians are increasing
Damiani et	Systematic	Patients	Greater uptake of health information technology in Greater uptake of health information technology information tec
al., 2013	Review	Physicians	compared to solo practices and a higher satisfaction with compensation was
		Healthcare Systems	noted.
Mosaly et al.,	Abstract	Physicians	Physicians who cross-cover patients may perceive that their workloads are
2013			increased, and performance decreased.

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			BMJ Open 60
			BMJ Open Between 2009 and 2011, groups of greater than 100 physicians continued to
Welch et al.,	Cross-	Physicians	Between 2009 and 2011, groups of greater than 100 physicians continued to
2013	sectional		increase in number, with a decrease in the number of solo practitioners. $\subseteq$
	Study		8 Jan
Xierali et al.,	Survey	Physicians	Family physicians in solo or small practices were less kely to adopt
2013			electronic health records compared to those in larger $group practices$ .
Heimeshoff	Survey	Physicians	Technical efficiencies were higher for group practices but this was also
et al., 2014			associated with higher costs compared to solo practices
Robinson &	Cross-	Physicians	Hospital owned physician groups had higher costs that physician owned
Miller, 2014	sectional		groups in California between 2009 and 2012.
	Study		groups in California between 2009 and 2012.
Schulte et al.,	Survey	Physicians	Family physicians were less likely to pass the American Board of Family
2014			Medicine maintenance of certificate exam if they were in a solo practice
			which was thought to result from the ability to spend $\vec{n}_{N}$ ore time on quality
			improvement and education within a group practice ( $\stackrel{\sim}{GR}$ 0.48 [95%CI 0.34 -
			improvement and education within a group practice (OR 0.48 [95% CI 0.34 - 0.68]).
Streu et al.,	Survey	Physicians	Working in a group practice was identified as a practice descent of the second
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			oyrigh:

			BMJ Open BMJ Open
			BMJ Open associated with professional burnout in plastic surgeons and comments from
2014			associated with professional burnout in plastic surgeons and comments from
			the survey seemed to indicate that this was due to poor $\vec{p}$
			relationships within groups.
Valentine et	Survey	Physicians	Surgeons working in solo practice were less likely to pass their maintenance
al., 2014			of certification examination compared to those in group practices (OR 0.22)
			[95% CI 0.06-0.77]).
Kralewski et	Survey	Physicians	Group practices that focus on improved screening and monitoring may
al., 2015			improve avoidable utilization, cost, and revenue.
Moosa et al.,	Survey	Physicians	GPs working in groups were more optimistic about the future compared to
2016			solo practitioners and worked fewer days but saw more patients per day.
Muhlestein &	Cross-	Physicians	Between 2013 and 2015, the largest changes in group practice size were a
Smith, 2016	sectional		decrease in small groups and an increase in very large $\underbrace{\underline{B}}_{\underline{B}}$ roups of over 100
	Study		physicians. Groups of 100 or more increased from 29.8% to 35.1%. Groups
			with 1-2 physicians decreased from 22.5% to 19.8%. $\frac{32}{22}$
Fryer et al.,	Survey	Patients	Improved utilization of emergency department and outpatient resources
2017			amongst patients with chronic illnesses in group practices who perceive a
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			BMJ Open
			BMJ Open 136/bmjopen-202
			higher level of integration.
Gisler,	Survey	Physicians	Young GPs in Switzerland prefer to work part-time in group practices of
Bachofner,			to 5 physicians.
Moser-			to 5 physicians.
Bucher,			·
Scherz, &		<sup>r</sup> o <sub>r</sub> <sub>D</sub>	Downloaded
Streit, 2017		D <sub>6</sub>	ded from
Kwietniewski	Survey	Physicians	Costs of group practices were higher than those of sole practices due to m
et al., 2017			investment in technological costs that solo practices would not be able to
			afford.
Mazurenko et	Survey	Physicians	Solo physicians had less health information technology and had less emai
al., 2017			correspondence with patients and other physicians. $\frac{b}{b}$
Viehmann et	Survey	Physicians	Chronic stress was identified in 26.3% of German GPs and practice assist
al., 2017			with no difference observed between those in solo and $\frac{1}{2}$ group practices.
Baker et al.,	Survey	Patients	The use of HIT, care management processes, and quality improvement
2018		Physicians	processes increased over time, but only quality improvement processes we
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			BMJ Open 136/bm
			BMJ Open attributable to a larger group size. Additionally, no significant differences
			attributable to a larger group size. Additionally, no significant differences
			were seen in cost and quality between different group $\vec{s}_{z}$
Kwietniewski	Survey	Physicians	Group practices of all sizes and most specialties have $\mathbf{k}_{\underline{s}}^{\infty}$
& Schreyögg,			more technical, cost, and profit efficiencies than solo $p_{\text{fig}}^{\overline{a}}$ actices and this was
2018		A.	thought to be due to the standardization of processes. $\frac{N_1}{Q}$
Noroxe et al.,	Survey	Physicians	More than half of Danish GPs reported at least one bugeout symptom. Those
2018			in group practices were less likely to report a poor work-life balance
			compared to solo GPs.
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Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED
TITLE			
Title	1	Identify the report as a scoping review.	1
ABSTRACT			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	2
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	4-5
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	5
METHODS			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	6
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	6
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	6
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	Supp App B
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	6-7
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	7
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	7
Critical appraisal of individual sources of evidence§	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate).	N/A
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	7



# St. Michael's

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SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
RESULTS			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	8 Figure 1
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	8 Supp App A
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	N/A
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	8-14 Supp App A
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	8-14
DISCUSSION			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	15-17
Limitations	20	Discuss the limitations of the scoping review process.	18
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	18-19
FUNDING			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	19

JBI = Joanna Briggs Institute; PRISMA-ScR = Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews.

\* Where *sources of evidence* (see second footnote) are compiled from, such as bibliographic databases, social media platforms, and Web sites.

† A more inclusive/heterogeneous term used to account for the different types of evidence or data sources (e.g., quantitative and/or qualitative research, expert opinion, and policy documents) that may be eligible in a scoping review as opposed to only studies. This is not to be confused with *information sources* (see first footnote).

<sup>‡</sup> The frameworks by Arksey and O'Malley (6) and Levac and colleagues (7) and the JBI guidance (4, 5) refer to the process of data extraction in a scoping review as data charting.

§ The process of systematically examining research evidence to assess its validity, results, and relevance before using it to inform a decision. This term is used for items 12 and 19 instead of "risk of bias" (which is more applicable to systematic reviews of interventions) to include and acknowledge the various sources of evidence that may be used in a scoping review (e.g., quantitative and/or qualitative research, expert opinion, and policy document).

From: Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMAScR): Checklist and Explanation. Ann Intern Med. 2018;169:467–473. doi: 10.7326/M18-0850.



# **BMJ Open**

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Group Practice Impacts on Patients, Physicians, and Healthcare Systems: A Scoping Review

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Objective: To identify the advantages and disadvantages that group practices have on patients, physicians, and healthcare systems.

Study design: A scoping review was performed based on the methodology proposed by Arksey and O'Malley, and refined by Levac and colleagues. Titles and abstracts were screened by two reviewers. A quantitative analysis was performed to assess the type, year, and region of publication as well as the population studied. A qualitative descriptive analysis was performed to identify common themes.

Study setting: MEDLINE, EMBASE, and Cochrane databases were searched for papers which assessed outcomes relevant to the research question.

Results: Our search strategy returned 2408 papers and 98 were included in the final analysis. Most papers were from the United States, were surveys, and assessed physician outcomes. Advantages of group practices for patients included improved satisfaction and quality of care. Studies of physicians reported improved quality of life and income, while disadvantages included increased stress due to poor interpersonal relationships. Studies of healthcare systems reported improved efficiency and better utilization of resources.

Conclusions: Group practices have many benefits for patients and physicians. However, further work needs to be done assessing patient outcomes and establishing the elements that make a group practice successful.

Strengths and limitations of this study:

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- This was a large, comprehensive overview of group practices from many countries

- The scoping review methodology allowed us to assess a wide variety of papers and identify key gaps in the knowledge for further study
- Patient engagement was instrumental on focusing this review on patient outcomes and areas for improvement
- This review was limited by language restrictions, heterogeneity of the data, and possible publication bias

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#### **INTRODUCTION**

Group practices have existed for over 100 years with one of the first groups set up by the Mayo brothers in the mid-1880s<sup>1</sup>. This group was eventually transformed into a large organization that has been recognized as a center of excellence leading to benefits for patients and physicians. Following their success, group practices became more and more common, and currently, many physicians around world are practicing within groups or partnerships<sup>2–5</sup>. Sizes of group practices vary dramatically, from 2 physicians to over 100 physicians, and there is no standard definition of what defines a group. Over the years many papers have been published on group practice formation assessing various advantages and disadvantages for patients, physicians, and healthcare systems as well as the impetus behind their development. The economic benefits of these groups and the improvements in service provision to patients is supported by the literature and has been well documented<sup>3,6–8</sup>. Barriers to the formation of group practices, or conflicts that can result from group practices have also been considered and often have to do with interpersonal relationships<sup>9–12</sup>. The extent of literature spans many decades and provides an excellent overview of how group practices have evolved and the effects which they have had on patients, physicians, and healthcare systems.

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Patient care can be significantly altered by the formation of group practices, and it is important to consider this impact as groups are often formed for reasons that are not directly related to patient care<sup>11,13–15</sup>. Some of these other reasons include the benefits realized by physicians with regards to income, quality of life, satisfaction, and decreased physician burnout, which is estimated to affect more than half of physicians <sup>9,16–19</sup>. Group practices also may be developed due to healthcare system incentives, or as a way to improve the income and efficiency of physicians within a given system<sup>14,20–23</sup>. This again may not be directly related to patient care

but may have impacts on the quality of care and its timeliness. Whatever the motivation for forming group practices, it is important to assess the effects on all involved stakeholders to ensure that this is a step in the right direction for the patients that we are committed to serve, the wellbeing of physicians, and the sustainability of the systems which we work within.

There has been a paucity of literature that synthesizes the knowledge published regarding group practices. A systematic review published in 2013 assessed the effectiveness of group versus solo practice amongst general practitioners (GPs) and demonstrated a positive association between group practices and clinical processes, physicians opinions, and innovation, but did not observe any effect for patient measures<sup>7</sup>. A recent review has also attempted to establish a definition for group practices and the overall shift towards their development<sup>24</sup>. The objectives of this study were to review the literature for evidence that assesses the advantages and disadvantages that group practices have on patients with regards to quality of care and satisfaction; physicians with regards to team dynamics, income, and satisfaction; and the financial impact on healthcare systems. A scoping review was performed as we expected to identify heterogenous studies with a wide range of outcomes focused on patients, physicians, and healthcare systems. A broad overview of the literature was desired to identify current knowledge gaps and guide further studies.

#### METHODOLOGY

A scoping review was performed according to the methodology proposed by Arksey and O'Malley, and refined by Levac and colleagues<sup>25,26</sup>. The PRISMA extension for scoping reviews (PRISMA-ScR) checklist was used to ensure all relevant aspects of a scoping review were included<sup>27</sup>. The following research question was developed:

What advantages and disadvantages do group practices have for patients, physicians, and healthcare systems?

A complete scoping review protocol was developed and published<sup>28</sup>. The following stages were incorporated into this scoping review according to what is suggested by Levac et al.: identifying the research question; identifying relevant studies; study selection; charting the data; collating, summarizing, and reporting results; and consultation. Full details on each stage can be found in the published protocol<sup>28</sup>. Briefly, MEDLINE, EMBASE and Cochrane Central were searched from database inception to October 2018 to identify relevant studies that assess the impact of group practices on patient care, satisfaction, and outcomes; physician quality of life, satisfaction, and income; and healthcare system finances. There were no restrictions placed on publication date. The grey literature was not searched as originally indicated in the protocol due to an adequate number of peer-reviewed articles which met inclusion criteria from the databases. The search strategy was peer reviewed according to the formal process outlined by McGowan et al<sup>29</sup>. The search strategy is included in Appendix A.

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Three members of the research team met to perform a calibration exercise and review 10 papers to pilot the screening and full text data extraction forms. Titles and abstracts were subsequently screened independently by two reviewers and the abstraction results from the full text articles were charted and verified by the same two members. Disagreements were resolved by discussion between the two reviewers as well as input from other authors of the paper. We included papers that:

- Included patients receiving, and/or clinicians providing care within any type of group practice (Population)

- Assessed the advantages and/or disadvantages of group practices (Concept)

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We examined all papers from group practices in all areas of medicine which reported outcomes relevant to patients, clinicians, or health system stakeholders (Context). Papers were excluded if they were not published in the English language.

DistillerSR (Evidence Partners, Ottawa, Canada) was used for screening and data extraction. A standardized form was created and tested on 10 papers by three members of the research team. We did not deviate from the protocol and charted authors, year of publication, country of origin, objectives, type and size of group practice, population studied (patients, physicians, etc.), sample size, methods and type of study, interventions, outcomes, and key findings<sup>28</sup>. This standardized form was used throughout the study and no changes were required after it was tested. We extracted and summarized included paper characteristics including type of study, year, region of publication, and the population studied. A qualitative analysis was also performed using a qualitative descriptive approach from the key findings of the selected papers<sup>30</sup>. A coding manual was created and codes were applied to the key findings. These were refined as the study progressed and grouped into themes. This was performed in parallel by two reviewers who then met to discuss the results and corresponding themes. After a conventional content analysis, common themes were grouped by:

1) patient care, including satisfaction and quality of care

2) physicians, including quality of life, competency, group dynamics, group characteristics, and financial impacts

3) healthcare system issues relating to financial impacts

A detailed quality assessment was not performed due to the heterogeneity of the data and the general principles of a scoping review<sup>26</sup>. During the scoping review process, we consulted with four surgeons from other group practices to ensure that the review was comprehensive and

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that all relevant papers were included. These surgeons were known by the research group to be participants in group practices.

## Patient and Public Involvement

A patient advisor was recruited from the Department of Patient Relations as part of the research team. As practice organization directly impacts on patients, it was essential that we had patient input into the design of the study and the analysis of the data. The patient advisor collaborated with the team and ensured that the research question and outcomes were applicable to patients and reviewed the final draft of the paper<sup>31</sup>.

## RESULTS

Using the search strategy outlined in Supplementary Appendix A, 2408 papers were identified. Of these, 35 were excluded as duplicates and 2373 titles and abstracts were screened. After screening, 149 full text articles were examined and 98 met inclusion criteria. Of those excluded, 34 did not assess advantages or disadvantages of group practices, 5 papers focused on multidisciplinary groups, 2 papers were based on a previous paper and did not provide any new data, and 1 paper assessed a dental group practice. We were unable to obtain full text articles for 9 papers. The PRISMA flow diagram in Figure 1 displays these results.

The majority of papers were from the United States (58%), followed by Europe (19%), and then Canada (15%). There were only a handful of papers from elsewhere in the world (7%). Papers frequently included more than one type of group practice. Family medicine was reported on most commonly (76%), followed by surgical practices (43%), and all others (36%). Physicians (94%) were the focus of almost all the papers rather than patients (26%), allied health (4%), or healthcare systems (10%). Some papers touched on multiple populations. Most of the

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included papers were surveys (63%). Group practices have been published on dating back until at least the 1960s. Recurring themes were evident over the years and are expanded on in the qualitative analysis. See Table 1 for a full description of included papers.

## Table 1 - Selected Paper Characteristics

Characteristic		n (%)
Region of Study	United States	56 (57%)
	Europe	20 (20%)
	Canada	16 (16%)
	Other	7 (7%)
Type of Group Practice	Family Medicine or General	74 (76%)
	Practitioner	
	Surgical	42 (43%)
	Other	35 (36%)
Population Studied	Physicians	92 (94%)
	Patients	25 (26%)
	Healthcare Systems	10 (10%)
	Allied Health	4 (4%)

Type of Publication	Survey	62 (63%)
	Letter	7 (7%)
	Case Report	6 (6%)
	Cohort Study	5 (5%)
	Abstract	2 (2%)
	Case Series	2 (2%)
	RCT	2 (2%)
	Systematic Review	2 (2%)
	Other	10 (10%)
Publications by Decade	1960-1969	6 (6%)
	1970-1979	9 (9%)
	1980-1989	5 (5%)
	1990-1999	9 (9%)
	2000-2009	23 (23%)
	2010-present	46 (49%)

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## 

## Group Practices Improve Patient Satisfaction and Experience

Sources that addressed patient outcomes are listed in Supplementary Appendix B. Six of these provided evidence that group practices can result in improvements in patient satisfaction<sup>23,32–35</sup>. Four of these sources were surveys that assessed changes in satisfaction after the implementation or expansion of a group practice. This sense of satisfaction appeared to be most commonly due to better perceived access to care and quality of care. In contrast to this, one survey from 1975 identified a negative effect on patient satisfaction and experience<sup>36</sup>. The Patient Perceptions of Integrated Care survey identified that patients with multiple chronic diseases who perceive a higher level of integration within a group will utilize less emergency department and outpatient resources<sup>37</sup>.

## Patient Quality of Care

The aspects of quality of care assessed by the papers included access to care, continuity of care, prescribing techniques, adherence of the physicians with established clinical guidelines, frequency of consultations, and unnecessary investigations and treatment. Twenty-two sources either identified an improvement in patient quality of care associated with group practices or a negative impact on patient quality of care. Two sources did not identify any differences in patient quality of care based on practice organization<sup>38,39</sup>.

## Group Practices Improve Patient Quality of Care

Twenty-two sources demonstrated improvements in patient quality of care. This included objective measures with quality of care scores as well as patient perception as captured by surveys. Group practices were found to improve access to care, comprehensiveness, waiting times, time spent with patients, efficiency, patient safety, and utilization of resources according to patient reported outcomes<sup>6,8,33,40–48</sup>. Patients perceived a higher quality of care with group

practices with regards to tangibles (equipment and facilities), reliability, responsiveness, assurance, and empathy<sup>49</sup>. Physicians in group practices had higher quality of care scores and adherence to guidelines was found to be better due to increased knowledge sharing and access to information<sup>35,44,50,51</sup>. Improvements in appropriate prescribing techniques were also associated with physicians working in group practices<sup>7,52</sup>. Physicians in group practices were also more likely to consult peers<sup>53</sup>. More patient-centered medical home processes within a practice were associated with larger groups compared to solo and small group practices (1-2 physicians), although all types of practices have shown modest increases over time<sup>54,55</sup>. However, a recent paper based on large surveys found no improvements in quality measures based on practice size<sup>56</sup>.

## Group Practices Negatively Impact Patient Quality of Care

Six sources noted some negative impacts with group practices on patient quality of care. This included worse continuity of care and dilution of the patient-doctor relationship<sup>41,57</sup>. Group practices have also been found to order more investigations or treat inappropriately if there was a financial benefit<sup>8,58,59</sup>. Additionally, a primary care internist who moved from a small practice to a large group practice after many years perceived that the level of care he was providing was compromised by the large group and payers setting targets for the group<sup>60</sup>. BMJ Open: first published as 10.1136/bmjopen-2020-041579 on 8 January 2021. Downloaded from http://bmjopen.bmj.com/ on April 17, 2024 by guest. Protected by copyright

### Physician Quality of Life, Satisfaction, and Burnout

Papers which assessed physician outcomes are listed in Supplementary Appendix B. Twenty papers assessed the relationship between group practices and physician quality of life, satisfaction, and burnout. Two papers did not find any significant difference in this area for group and solo practices<sup>61,62</sup>. Two main themes were identified from the sources including the

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following: group practices improve physician quality of life and satisfaction, and group practices lead to conflict and additional stress for physicians.

## Group Practices Improve Physician Quality of Life and Satisfaction

Group practices were often found to improve the work-life balance and job satisfaction of physicians when compared to solo practices<sup>9,19,63–67</sup>. Being a member of a group practice led to less professional isolation, improved knowledge sharing, and an improvement in professional development<sup>9,19,68</sup>. Improved attitudes about group practices in the Netherlands were related to an increased desire for contact and cooperation with other physicians<sup>69</sup>. Satisfaction with personal and lifestyle factors and optimism for the future was increased amongst physicians in group practices<sup>70,71</sup>. Group practices were also associated with a decreased call burden and increased cross coverage of patients which directly impacts the quality of life for most physicians and their families<sup>6,68</sup>. Due to the aforementioned benefits, group practices have also been noted to improve retention and recruitment initiatives, especially in rural or underserviced areas<sup>68,72</sup>. Group Practices Lead to Conflict and Additional Stress for Physicians

Seven sources have identified issues with group practices that create conflict and additional stress for physicians. These center around the interpersonal relationships of the group members and sustainability<sup>63</sup>. Poor interpersonal relationships lead to lower job satisfaction and a higher degree of professional burnout<sup>73,74</sup>. Three papers identified that group practices were also associated with increased physician demands, decreased performance, and reduced autonomy<sup>74–76</sup>. A large survey of family physicians in Canada found that physicians in solo practice had more job satisfaction than those in group practices in a survey that was primarily assessing improved satisfaction with performing procedures<sup>77</sup>.

# Group Practices Improve Physician Competency

Two papers addressed differences in physician competency<sup>78,79</sup>. Family physicians and surgeons were found to be less likely to pass their respective maintenance of certification exams if they were in a solo practice. This was thought to result from the ability to spend more time on quality improvement and education within a group practice.

## Facilitators and Barriers Associated with Working in a Group Practice

An important theme that arose during analysis was the identification of barriers and facilitators associated with forming or maintaining a group practice. These characteristics have direct impacts on patient care and physician quality of life, job satisfaction, and burnout. Eight sources identified these characteristics and they are summarized in Table 2<sup>10,12,22,80–84</sup>. Table 2 - List of Barriers and Facilitators for Group Practices

Facilitators	Barriers
Teamwork <sup>81,82</sup>	Incompatible personalities <sup>10,22</sup>
Leadership <sup>22,81</sup>	Poor leadership <sup>12</sup>
Common vision <sup>84</sup>	Different visions for the group <sup>12</sup>
Patient centred care <sup>81</sup>	Disagreements about re-imbursement <sup>12</sup>
Quality improvement <sup>81</sup>	Legal and real estate issues <sup>10</sup>
Accountability <sup>81</sup>	Dissatisfied office staff <sup>12</sup>
Sense of ownership <sup>81</sup>	Fears about loss of autonomy <sup>80</sup>
Sense of responsibility <sup>82</sup>	
Cohesiveness <sup>82,83</sup>	

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# Group Practices Lead to Higher Incomes for Physicians

Seven sources from the United States, Taiwan, and South Africa have identified increased individual earnings for physicians practicing within group practices<sup>15,21,71,85–88</sup>. Physicians in group practices have also been shown to be more satisfied with their compensation. A letter published in 1968 highlighted income deferral by physicians until later in life when they were less productive as an additional benefit of group practices<sup>89</sup>. Currently, larger groups may be forming in the United States as they are able to leverage insurers more effectively and build up more market share<sup>3</sup>.

## Costs of Group Practices are Higher than Solo Practices

Costs of group practices have been found to be higher than those of solo practices<sup>20,90,91</sup>. This may be due to more investment in technological costs that solo practices would not be able to afford<sup>20,91</sup>. Some large group practices may also be more inefficient than solo or small group practices<sup>92</sup>.

## Group Practices May Improve the Uptake of Health Information Technology

Physicians practicing in groups are more likely to have greater access to health information technology (HIT) and were also more likely to correspond with their patients and other providers via email<sup>7,93</sup>. Family physicians in the United States in solo practices were found to be less likely to adopt electronic health records when compared to those in group practices<sup>94,95</sup>. Data from two large surveys indicated a general trend towards increased use of HIT over time, but did not see a clear association between group size and an increased use of HIT<sup>56</sup>.

More Physicians are Practicing in Group Practices and Group Practices are Increasing in Size

Many sources have tracked the rise in the number and type of group practices over the years (Supplementary Appendix B). The definition of a group practice is very heterogenous in

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the literature and previous work has been done in an attempt to classify groups<sup>24</sup>. Often, groups of 1-19 physicians are classified as small or medium (further subclassified into groups of 1-2, 3-7, 8-12, and 13-19), and groups of 20 or more are classified as large (further subclassified into groups of 20-99 and >100).<sup>54,55</sup> The included papers show an increase in the absolute number of group practices and their sizes over the years.

In 1968, group practices were mostly limited to hospitals with most other physicians working in solo practices outside of the hospitals, and it was believed that group practices would not be taken up unless it was established as a desirable form of practice to society and health care professionals<sup>96,97</sup>. Now, in the United States, more physicians across all specialties are forming or joining larger groups and groups of more than 100 physicians which usually have non-physician owners, have grown rapidly in recent years<sup>2–4</sup>. This increase has been driven by the benefits group practices can offer physicians<sup>11,13,98–101</sup>.

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Despite having a very different healthcare system, group practices have also grown in Canada. In 1970, 57% of graduating physicians entered a group practice or partnership, 21% entered solo practice, and 22% became salaried physicians. Surgeons and psychiatrists were most likely to enter solo practice<sup>5</sup>. A survey of Canadian physicians in 1987 found that around half of the physicians were in either solo or group practices and the other half had some group practice arrangements for financial benefits<sup>14</sup>. Government support was seen as a key factor in establishing group practices<sup>14,102</sup>.

## Group Practices May Help Reduce Costs Within Healthcare Systems

Group practices have the potential to impact healthcare systems financially, with respect to access to care, and appropriate utilization of healthcare resources. Sources have shown that group practices of all sizes and most specialties have been shown to have more technical, cost,

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and profit efficiencies than solo practices (Supplementary Appendix B)<sup>103,104</sup>. This is thought to be due to the standardization of processes<sup>104</sup>. Group practices that focus on improved screening and monitoring may improve avoidable utilization, cost, and revenue<sup>103</sup>. A higher level of integration perceived by patients with chronic illnesses also reduces utilization of emergency department and outpatient resources<sup>37</sup>. Income pooling within an obstetrical call group in a Canadian study led to decreased rates of elective induction of labour in a before and after study<sup>105</sup>. Older data from the Physicians' Practice Cost and Income Survey in 1986 found no significant differences in practice efficiency between solo and group primary care practices in the United States<sup>106</sup>. Additionally, a recent paper which included data from large surveys found that group size was not associated with an improvement in spending or quality<sup>56</sup>.

## DISCUSSION

We were able to identify themes associated with the advantages and disadvantages that group practices have for patients, physicians, and healthcare systems. It is important to note that the term 'group practice' refers to a broad range of practice types within the literature and there is no clear definition with respect to the critical pieces that define what a group practice is beyond the number of physicians and inclusion of one or more specialties. Organizations in the United States such as the America's Physician Groups, and American Medical Group Association have been developed to represent physicians in various types of groups. Groups may be defined as single specialty with two or more physicians or multispecialty with any number of different specialties providing care to patients.

Themes involving patients included satisfaction and quality of care. Generally, patients seemed to be more satisfied with care that was being received from physicians in group

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practices<sup>23,32,33,40</sup>. From these studies, this appears to be due to increased access to care and decreased waiting times. Although continuity of care would seem to be a legitimate concern with a group practice as patients may be seeing different physicians on any given day, this was actually shown to be improved in one study<sup>23</sup>. Concerns surrounding continuity of care were raised in one study which addressed non-adherent patients in a group practice<sup>57</sup>. Furthermore, in a situation that is unique to a surgical group practice, patients did not seem to be concerned by the fact that they might not meet the surgeon who is operating on them until the day of their operation as they had confidence in any of the surgeons associated with the group<sup>33</sup>.

While it is important that patients are satisfied with the care they are receiving, it is imperative that they also receive high quality care. Overall, most papers indicated that the quality of care increased with a group practice structure as measured objectively and subjectively. Adherence to guidelines and appropriate prescribing was better with group practices and quality of care scores improved<sup>7,51,52</sup>. There were some notable exceptions including using radiation therapy for prostate cancer when it was not necessarily indicated because the group owned radiation facilities, and the increased use of laboratory investigations offered by the group<sup>15,58,59</sup>. This may have been driven by convenience as well as financial gain.

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Overall, patients appear to benefit from group practices through improved quality of care, access, and satisfaction. The data surrounding the impact of group practices on patients was presented in 24% of papers. This has been identified as an area for further research as we know that group practices are often formed to primarily benefit the physicians working within them<sup>6,68,72</sup>.

Numerous advantages of group practices for physicians have been identified from this scoping review. They include increased quality of life and satisfaction, decreased burnout, higher

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competency, and financial gain. More attention has been paid to physician burnout in recent years as the prevalence is surprisingly high<sup>17,18</sup>. Improving the quality of life and job satisfaction for physicians may help with this and group practices have the potential to help in these areas. Overall, most of the literature included in this review shows a positive association with group practices and physician quality of life and job satisfaction. These improvements result from a better work-life balance, shared call responsibilities, improved knowledge transfer, collaboration, and decreased professional isolation<sup>6,9,63,66</sup>. Physicians in solo practices may still be able to pursue similar opportunities but may face logistical challenges due to isolation.

A notable area of decreased satisfaction results from poor interpersonal relationships<sup>12,22</sup>. This can lead to the collapse of a group and highlights the need for group practice members to be compatible and share a common vision, especially if they are financially integrated. As groups become larger and larger, especially in the United States where groups of more than 100 physicians are not uncommon, relationships can become less collegial and autonomy may be lost<sup>80</sup>. The importance of regular meetings with a shared sense of ownership and responsibility has been shown to be very important to group function and quality of care<sup>81,84</sup>. Therefore, although groups have the potential to improve job satisfaction and quality of life for physicians, it depends on the overall functioning of the group and compatible personalities within the group for this to be achieved.

In the two papers assessing the level of physician competency (based on whether or not physicians were members of group practices) the overall impact seems to be positive with improved scores on certification exams<sup>78,79</sup>. This is thought to be due to more knowledge transfer between group members and less professional isolation. The ability to approach and consult

colleagues relatively easily about difficult or interesting clinical questions has the potential to enhance the learning of all group members and improve patient care.

Financially, group practices have been shown to improve incomes of physicians. This is most relevant in the United States where groups are often formed to gain negotiating leverage with payers<sup>11,13</sup>. However, individual incomes also seem to be higher in other areas of the world such as New Zealand, South Africa, and Taiwan<sup>71,86,87</sup>. The increased income may help offset costs associated with investments in equipment or technology that would not be feasible for solo physicians.

The impact of group practices on healthcare systems can be seen in improvements in access to care, system efficiencies, improved use of resources, and adherence to guidelines. Some exceptions to this may include inappropriate use of resources if there is a financial gain. Moving forward, this will be an important area of study as there are many different health care systems in place around the world. BMJ Open: first published as 10.1136/bmjopen-2020-041579 on 8 January 2021. Downloaded from http://bmjopen.bmj.com/ on April 17, 2024 by guest. Protected by copyright

This scoping review has allowed us to identify gaps in the literature which can be addressed in the future. As demonstrated above, patient care is often not the focus of research into group practices. This needs to be addressed to ensure that we are improving the service that is being delivered to the end user, namely, the patient. Creating a shared or group practice is often beneficial to physicians, but if the patient experience or quality of care is negatively impacted, this needs to be understood. Additionally, it was difficult to separate different types of group practices in the literature. The definition of a group practice varies significantly and includes anywhere from 2 to >100 physicians and/or allied health care providers<sup>24</sup>. This makes comparisons difficult. However, this scoping review has allowed us to perform a high level overview of all types of group practices and in an attempt to identify all characteristics which are

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important to patients and physicians. The knowledge gaps we identified with respect to this issue includes a group practice definition and which elements contribute to a successful practice which benefits patients and physicians.

As part of the scoping review process, key stakeholders were consulted regarding this review. They included a patient advisor and members of other group practices. The patient advisor was included in the design of this study, verified the results, and reviewed the final draft of this manuscript. Other group practice members verified the results by reviewing the themes and included references, ensuring that all relevant papers were included. The patient advisor and group practice members will help to guide further research in the future. Some of the authors of this paper are group practice members and will be using their practice for research that will focus on patient outcomes including quality of care and satisfaction, as well as physician outcomes including quality of life, satisfaction, and burnout with guidance from this scoping review.

There are inherent limitations with a scoping review. This was meant to be a broad overview of the available literature and as such, the data are heterogenous and does not lend itself well to a quality assessment. There may very well be a publication bias with this topic as authors may only be inclined to publish on group practices that have worked very well. We were unable to obtain the full text for 9 papers. The included papers were also from many different regions and therefore, the conclusions may not be applicable to a particular country or region, however the objective of this review was to assess the advantages and disadvantages of group practices and common themes were identified that likely transcend many regional differences.

## **CONCLUSION**

A group practice structure has many advantages for patients and physicians alike. Although the data is somewhat limited for patients compared to physicians, this scoping review

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has shown that there is a generally positive patient experience with some evidence of improved quality of care. There is also an increase in physician satisfaction and quality of life in groups that function well with compatible personalities. This scoping review has summarized the available literature based on our research question and has allowed us to identify two interesting areas of future investigation. First, it will be important to define exactly what the critical elements of a group practice are beyond the number of physicians as there is no standard definition that we were able to discern in this scoping review. This may then be used to guide the development of functional groups that are able to improve care and quality of life for both patients and providers. Second, although most of the available literature is directed towards the impact of group practices on physicians, addressing patient outcomes and perspectives is essential. This has been addressed in the literature more recently, and is an area which should be further developed. CONFLICT OF INTEREST The authors declare that there is no conflict of interest.

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## DATA AVAILABILITY STATEMENT

All data used are included in the article and supplementary appendices.

## CONTRIBUTORS

HM, TZ, DM, and FB conceived the study. TZ and HM drafted the protocol and developed the research question. TZ and SA performed the title and abstract screening and full text data extraction. TZ, HM, JB, TW, and SR contributed to the thematic analysis and interpretation of the data. All authors read and approved the final manuscript. HM is the guarantor.

## FIGURE LEGEND

Figure 1 - PRISMA flow diagram for screened and included papers.

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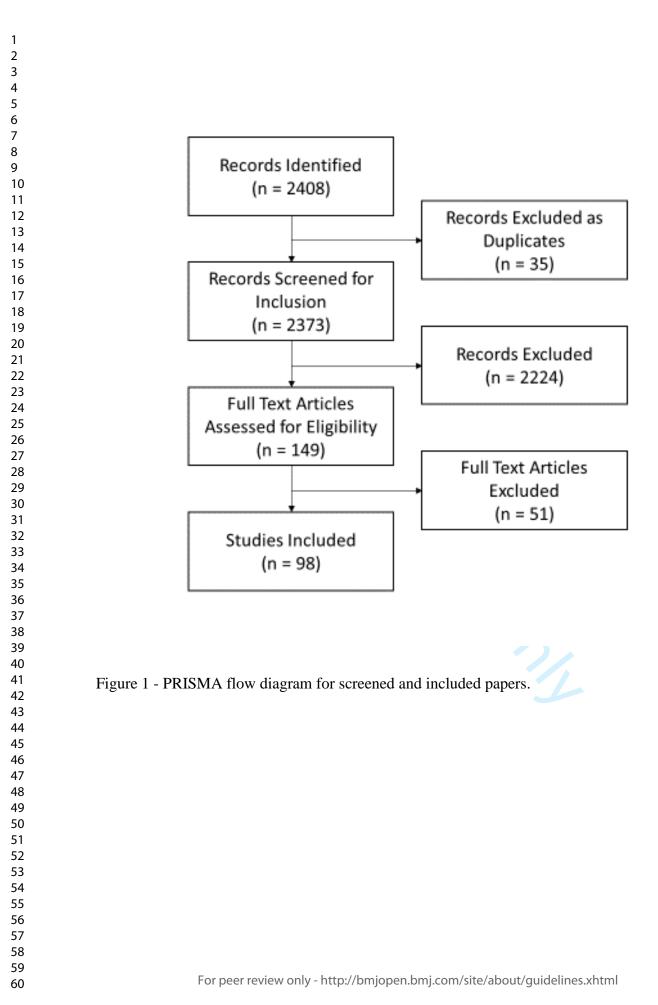
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37 12 and 36 (3422)		
38 group practice*.ti,kw. or (group medical practice* or medical group practice*).tw,k		group practice*.ti,kw. or (group medical practice* or medical group practice*).tw,kw
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42	limit 41 to english language (3323)
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47	*physician/ or *anesthesiologist/ or *cardiologist/ or *dermatologist/ or *emergency
	ician/ or *endocrinologist/ or *gastroenterologist/ or *general practitioner/ or *geriatrician/ or
	ontologist/ or *gynecologist/ or *hematologist/ or *hospital physician/ or *immunologist/ or nsivist/ or *internist/ or *neonatologist/ or *nephrologist/ or *neurologist/ or *obstetrician/ or
	oncologist/ or *ophthalmologist/ or *orthopedic specialist/ or *otolaryngologist/ or
	ologist/ or *pediatrician/ or *physiatrist/ or psychiatrist/ or *pulmonologist/ or exp *radiologist/
	neumatologist/ or exp *surgeon/ or *urologist/ (262673)
48	(allerg* or an?esthesiolog* or cardiolog* or clinician* or dermatolog* or endocrinolog* or
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	olog* or obstetric* or oncolog* or ophthalmolog* or otolaryngolog* or patholog* or iatrician* or neonatolog* or physiatr* or pulmonolog* or orthop?ed* or radiolog* or
	natolog* or surgeon* or neurosurgeon* or urolog* or general practitioner*).tw. (5716273)
49	(family physician* or primary care physician*).tw. (68204)
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51	47 or 48 or 49 or 50 (6368299)
52	46 and 51 (6994)
53	(group physician* or group surgeon*).tw. (683)
54 55	52 or 53 (7627) exp *"salary and fringe benefit"/ or *income/ (26491)
56	exp *treatment outcome/ (62134)
57	exp *"quality of life"/ (156501)
58	*health care quality/ (102682)
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61 62	*lifestyle/ (32389) (life style or lifestyle).tw. (189605)
63	*stress/ or *burnout/ (63482)
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65	"perception of care".tw. (479)
66	health care organization/ (123801)
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70	(revenue* or profit or profits).tw. (52523) *reimbursement/ or *health insurance/ (81697) *health care quality/ (102682)
71	*reimbursement/ or *health insurance/ (81697)
72	*health care quality/ (102682)
73	*patient satisfaction/ (45768)
74	*satisfaction/ or *job satisfaction/ or *life satisfaction/ (37526)
75 76	satisfaction.tw. (253885) patient reported outcome*.tw. (25479)
70 77	or/55-76 (4161152)
78	54 and 77 (2598)
79	limit 78 to english language (2485)
80	79 use emczd (1433)
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84	43 or 83 (2888)
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87	85 use emczd (551) Embase
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# Supplementary Appendix B

 
 Table 1 - Papers Assessing Patient Outcomes

Author	Study Design	Population Studied	Key Findings
Sellers, 1965	Retrospective	Patients	More laboratory investigations and consultations for group practice patients
	cohort study	Physicians	and patients report more personal attention and in-dep explanations of a
		D-	diagnosis and treatment by physicians in solo practice $\frac{3}{8}$
Graham,	Review	Physicians	Limited evidence shows improvement in accessibility continuity, quality, and
1972			efficiency with group practices. Potential drawbacks included dilution of the
			doctor-patient relationship and less autonomy.
Ritchey, 1975	Survey	Patients	Patients with solo GPs have better relationships with their physicians. Patients
			with GPs in group practice have greater unmet needs.
Roos, 1980	Retrospective	Physicians	Quality of care and productivity were not found to be different for physicians
	Cohort study		in solo vs group practices in Manitoba.
Cohen et al.,	RCT	Patients	Patients were randomized to a new group practice model and found no
1986		Physicians	changes to patient satisfaction but there was a decrease in charges and
		Allied Health	utilization for patients as well as improved access to care, and decreased
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			BMJ Open
			BMJ Open 36bm open-2022 waiting times. 0-04
			waiting times.
Kuyvenhoven	Survey	Patients	GPs in the Netherlands were surveyed and 20% of solog physicians stated th
et al., 1990		Physicians	they never consulted their peers, while those working $\frac{1}{2}$ a group practice di
			so regularly, which was found to help improve the level of attention paid to
			somatic complaints.
Gawande &	Survey	Patients	Patient satisfaction increased following the expansion of a group practice fr
Benroth,		Physicians	18 to 36 orthopedic surgeons in Indianapolis. This was
1999			decreased waiting times and increased time spent with surgeon.
Campbell et	Survey	Patients	Solo GP practices have shorter consultation lengths (19.2 min) vs group
al., 2001		Physicians	practices (17.8 min).
		Healthcare Systems	.com/ or
Lin et al.,	Survey	Patients	Patients perceive better overall quality of care in primary care group practic
2004			compared to solo practices with regards to equipment, facilities, reliability,
			responsiveness, assurance, and empathy.
Orrantia,	Case Report	Patients	A family group practice that was established in Marathon, Ontario allowed
2005		Physicians	the maintenance of a stable number of physicians and $\frac{\overline{d}}{\underline{d}}$ is allowed for
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			BMJ Open 30
			BMJ Open 36/bmjopen-202
			increased health care services offered to the community.
Ashworth &	Survey	Patients	Group practices obtained significantly higher Quality and Outcomes
Armstrong,		Physicians	Framework scores in the UK when compared to solo $p_{\underline{s}}$
2006		$\mathbf{\wedge}$	nuary 202
Breon, 2009	Case Report	Physicians	After the establishment of a surgical group practice in gural Iowa by five
		Healthcare Systems	surgeons the access to surgical care at multiple hospitass improved and shared
		Ne	call coverage was achieved.
Gaal et al.,	Survey	Physicians	Larger primary care practices in Europe were found to have more patient
2010			safety features present, but clinical outcomes were not assessed in this paper.
Tourigny et	Survey	Patients	Patient perception of continuity of care increased, accessibility remained the
al., 2010			same, and physician co-ordination with specialists decreased in this before an
			after study following implementation of group practices in Quebec.
Weeks et al.,	Cross-	Patients	Large multispecialty group practices enrolled with the Council of Accountabl
2010	sectional		Physician Practices delivered better quality of care at $\frac{1}{2}$ lower cost than other
	Study		groups.
Rittenhouse	Survey	Patients	Larger groups used more patient-centered medical home processes than solo
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			BMJ Open
			BMJ Open 360 mjopen 2000 PM 2 physician groups. 4
et al., 2011			2 physician groups.
Landon, 2012	Conference	Healthcare Systems	A primary care internist who moved from a small prace to a large group
			practice after many years found that the level of care $h_{\underline{\beta}}^{\infty}$ was providing was
			compromised by the large group and payers setting targets for the group. $\overset{\text{as}}{\overset{\text{b}}{\aleph}}$
van den	Survey	Patients	From a survey of patients seen in a group practice herita clinic, most were
Heuvel et al.,		6	found to be satisfied with any surgeon from the group $\frac{5}{8}$ erforming their
2012			surgery, even if they hadn't met them until the day of surgery, and felt that
			group practice allowed for more efficient use of resources.
Damiani et	Systematic	Patients	GP group practices had positive impacts on prescribing appropriateness
al., 2013	Review	Physicians	compared to solo practices. Other quality measures were found to have
		Healthcare Systems	insufficient evidence in the included papers.
Devlin et al.,	Survey	Patients	Larger family physician group practices were associated with better access
2013		Physicians	care, comprehensiveness, and disease prevention. Continuity of care was
			negatively affected.
Ly & Glied,	Survey	Patients	Large primary care group practices (> 10 physicians) $\frac{10}{3}$ the United States w
2013		Physicians	found to have shorter waiting times by 14 minutes for $\frac{d}{d}$ atients.
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			BMJ Open 136/bmjopen-202
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Mehrotra et	Cross-	Patients	Patients in integrated medical groups received higher duality care based on 6
al., 2013	sectional		quality measures compared to independent practice as sociations. The self-
	Study		reported use of electronic medical records was higher $a_{B}^{\infty}$ well.
Perkins et al.,	Survey	Physicians	Obstetricians and Gynecologists in the United States are more likely to adhere
2013			to established cervical cancer prevention guidelines if $\mathbf{\hat{b}}_{\boldsymbol{\beta}}^{\mathbb{N}}$ are part of a group
			practice, possibly because of improved knowledge shaging and access to
			information.
Pichetti et al.,	Survey	Physicians	In France, those who work in groups were more likely to prescribe multiple
2013			sourced rather than patented statins than solo practitioners.
Visca et al.,	Survey	Patients	No clinically significant difference was found between solo and group
2013		Physicians	practices in the management of chronic diseases by $G_{S}^{B}$ .
Wiley et al.,	Survey	Patients	Processes for the patient-centered medical home mode have increased in all
2015		Physicians	group practices sizes over time but are only present indess than half of even
			large groups. Additionally, a reduction in patient involvement in care was
			noted over time.
Fryer et al.,	Survey	Patients	The Patient Perceptions of Integrated Care survey idemified a decrease in
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			BMJ Open
			BMJ Open utilization of emergency department and outpatient resources amongst patient
2017			utilization of emergency department and outpatient resources amongst patient
			with multiple chronic illnesses who perceived a higher devel of integration $\frac{\overline{\sigma}}{2}$
			the group practice that delivered care to them. $\frac{1}{2}$
Baker et al.,	Survey	Patients	No significant changes reported in quality measures based on group practic
2018		Physicians	size.
Bardos et al.,	Cohort	Patients	Compared to those in groups, solo obstetricians had a bigher Cesarean section
2018		Physicians	rates but lower rates of shoulder dystocia and third or fourth degree tears
			which was felt to indicate that they had a more conservative approach to
			labour.
Cohidon et	Survey	Patients	Patients in family physician group practices in Switze
al., 2018		Physicians	experience with continuity and co-ordination of care compared to solo
			practices. No differences were seen in their experience with access and
			communication between the practice types.
Ellis et al.,	Systematic	Patients	In a limited number of studies, patients appeared to be more satisfied with
2018	review	Physicians	specialist group practices rather than solo practices with respect to tangible
			and their own assessment of quality.
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			BMJ Open
			BMJ Open In a group practice, there may be differing opinions and risk tolerance amongs
Freemyer &	Case Report	Patients	In a group practice, there may be differing opinions and risk tolerance among
Stoff, 2018		Physicians	members especially with non-adherent patients and potentially dangerous
			medications. In order to minimize the effect on continuity of care, physicians
		$\mathbf{A}$	in group practices should develop policies around chattenging situations and
			apply these consistently to patients.
Hollenbeck et	Cohort	Patients	Prostate cancer patients were found to be more likely to be the second with intensity-
al., 2018		Physicians	modulated radiation therapy if the urology group owned radiation facilities
			regardless of group size even if the treatment was unlikely to be beneficial,
			suggesting that the financial incentive outweighed besperactices in prostate
			cancer care and that group practices do not prevent conflicts of interest.
Stol et al.,	Survey	Physicians	Practices that implemented selective prevention for cardiometabolic diseases
2018			were more often group practices rather than solo practices. These practices
			were also organized better for chronic disease management.
Xierali, 2018	Cross-	Physicians	Physicians in group practices were more likely to practice at multiple sites
	sectional		which may increase the access to care for patients.
	study		which may increase the access to care for patients.
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Table 2 – Papers Assessing Physician Outcomes
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			BMJ Open BMJ Open
Table 2 – Pap	BMJ Open 36/bmjopen-2020-04157		
Author	Study Design	Population Studied	Key Findings 9 ∞
Bailey, 1968	Cohort	Patients	Physicians, rather than patients, benefit the most from multidisciplinary group
		Physicians	practices as their output was lower, fees were higher, $add$ they ordered more
		0	tests especially if that service was offered by the group
Rose, 1968	Letter	Physicians	Income deferral by physicians until later in life when they were less
			productive was viewed as a benefit of group practices.
Terris, 1968	Letter	Physicians	Group practices were mostly limited to hospitals with most other physicians
			working in solo practices outside of the hospitals, and $\frac{2}{3}$ was believed that
			group practices would not be taken up unless it was established as a desirable
			form of practice to society and health care professionals.
Weinerman,	Letter	Patients	Group practices needed to be refocused on patients in $\frac{5}{3}$ of the relevant to
1968		Physicians	societal needs.
Verbeek-	Survey	Physicians	A significant desire for contacts and co-operation with other general
Heida, 1969			practitioners led to improved attitudes about group practices in the $\frac{9}{2}$
			Netherlands.
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			BMJ Open 136/bmjopen-202
Mahoney,	Survey	Physicians	Future surgeons preferred solo practice due to the potential loss of autonom
1973			while future obstetricians and pediatricians preferred $pg_{g}^{\vec{\sigma}}$
			and future internists preferred group practices.
Wallace,	Letter	Physicians	This letter from the secretary-general of the Canadian Medical Association
1974			highlighted the possible need for government support $\bigcup_{i=1}^{N}$ help with the
			establishment of medical groups.
Evashwick,	Cross-	Physicians	Non-metropolitan areas in the United States that have $\frac{8}{4}$ greater percentage of
1976	sectional		group practices have better retention and recruitment rates.
	Study		bmjope
Kimbell &	Survey	Physicians	In 1979 in the United States, physician annual gross regenue, total patient
Lorant, 1977			visits per year, and office visits per year were measured and there were
			increasing returns to scale for physicians in solo or small group practice and
			inefficiencies noted in large group practices.
Paulick &	Survey	Physicians	In Canada, 57% of graduating physicians entered a group practice or
Roos, 1978			partnership, 21% entered solo practice, and 22% became salaried physicians
			Surgeons and psychiatrists were most likely to enter $s_{\underline{\alpha}}^{\underline{\beta}}$ practice.
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			BMJ Open 66 33 90
			BMJ Open 136/bmjopen-202
Davies, 1979	Survey	Physicians	In 1978 in New Zealand, group practices had higher cost than solo pract
Graham,	Survey	Physicians	The Manpower Survey of Oral Surgery was performed and it was repor
1979			that oral surgeons working in group practices had higher incomes and $\exists \exists z = 0$
			employed fewer full-time equivalent staff per surgeon
Pasternak et	Survey	Physicians	There was no significant difference in physician satisfication between the
al., 1986		6	practicing in groups vs those in solo practice in the southwest United Sta
McCormick	Survey	Physicians	GPs in solo practice earn less than those in group practices (gross incom
& Thomson,			19% less) due to lower fees and lower numbers of patients seen.
1989			bmjoper
Holden, 1990	Letter	Physicians	Solo family physician practice in rural areas was in degline and unlikely
			succeed as group practices were forming and offering better benefits to
			graduating residents.
Williams et	Survey	Physicians	Half of the physicians were in either solo or group practices and the othe
al., 1990			had some group practice arrangements for financial benefits. They
			hypothesized that future formation of group practices would require som
			incentives from government, which has happened.
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			BMJ Open 36 BMJ Open 90
			BMJ Open A unique group practice without walls structure is deserbed which allows for
hryver et C	Case Report	Physicians	A unique group practice without walls structure is described which allows for
, 1993			the formation of a group with physicians at different locations. The member
			enjoy the business and professional benefits of a group practice, but this still
			allows for autonomy, decentralization, and individual $\vec{p}$ ractice style.
ays & In	nterviews	Physicians	GPs in Australia who were interested in forming group practices were
nderson,		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	completed and identified incompatible personalities or practice styles, legal
94			and real estate issues, and initial costs as barriers.
onnor et al., Su	Survey	Physicians	Group practice opportunities are an important aspect in recruiting physician
95		Healthcare Systems	to practice in a rural hospital in order to reduce isolation, pool resources, and
			decrease call burden.
amps, 1995 St	Survey	Physicians	Physicians in private group practices were significantly more satisfied with
			personal and lifestyle factors than those in solo, hospite $\mathbf{A}$ , or health
			maintenance organization related practices.
efelice & Si	Survey	Physicians	Data from the Physicians' Practice Cost and Income Sarvey found no
adford,			significant differences in practice efficiency between solo and group primar
97			care practices in the United States.
97			care practices in the United States.

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			BMJ Open
			BMJ Open 136/bmjopen-202
Hueston,	Survey	Physicians	GPs associated with solo or small group ( $\leq 3$ physicians) practices were for
1998			to be less satisfied.
Dowell et al.,	Survey	Physicians	$\operatorname{GPs}$ associated with solo practices were found to be less satisfied than the
2000			in group practices.
Bland et al.,	Cohort	Patients	Income pooling within an obstetrical call group in a Canadian study led t
2001		Physicians	decreased rates of elective induction of labour in a before and after study $\frac{5}{6}$
Romano,	Letter	Physicians	Group practices generally enhanced United States physicians' quality of
2001			improved patient care, improved professional development, and led to his
			earnings.
Sturm, 2002a	Survey	Physicians	Data from the Community Tracking Study was used to show that surgeon
			working within a small practice was the greatest predictor of career $\mathbf{S}^{\mathbf{S}}_{\mathbf{S}}$
			dissatisfaction and that patient quality of care was $imp\underline{\underline{A}}$ cted by income
			pressures as well as decreased continuity of care and clinical freedom with
			solo or 2 surgeon practices.
Sturm, 2002b	Survey	Physicians	Data from the Community Tracking Study found that physicians working
			within a solo or 2 physician practice was the greatest predictor of career
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			yrigh

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			BMJ Open 136/bmjopen-202
			dissatisfaction. They also reported less clinical freedore and constraints on
			income.
Casalino et	Survey	Physicians	Data from the Community Tracking Study was also us
al., 2003		Healthcare systems	frequently cited reason for group practice formation was negotiating leverag
			and barriers included lack of leadership, physician co-operation, and
		- C	investment.
Crane &	Case Report	Physicians	The growth and subsequent deterioration of a large orthopedic group practic
Dennis, 2003		Healthcare systems	which amalgamated multiple smaller groups is described. The eventual
			demise of the practice appeared to be due to poor leadership, disagreements
			over re-imbursement, differing visions for the future $o$ the group, dissatisfie
			office staff who were in danger of being let go due to $\frac{g}{g}$ intralization, difficul
			in negotiations with payers, and being undercut by smaller competing group
Curoe et al.,	Survey	Physicians	Physicians in the United States found that as group practice size increases, the
2003			culture is less collegial, less cohesive, and there is less organizational trust $\mathbf{\hat{g}}$
			which was also true for multi-specialty practices compared to single
			specialty.
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			BMJ Open 80
			BMJ Open BMJ Open Physicians working in solo practices viewed improved quality of life,
Feron et al.,	Survey	Physicians	Physicians working in solo practices viewed improved quality of life,
2003			knowledge sharing, and continuity of care as motivation to form a group $g$
			practice. Interpersonal relationships, budget issues, $\log_{\frac{\infty}{2}}^{\infty}$ of the patient-
			physician relationship, and differing views of the group were viewed as
			barriers.
Casalino et	Survey	Physicians	Data from the Community Tracking Study was used to assess the reasons f
al., 2004		Healthcare systems	growth of group practices and it was seen that physicians were increasingly
			forming single specialty group practices to not only increase the scope of
			surgical services and diagnostic imaging they could offer, but also gain
			negotiating leverage with payers.
Lin et al.,	Survey	Physicians	In Taiwan, higher incomes were realized by physician who were in single
2006			multi-specialty groups when compared to solo practice physicians.
Solberg et al.,	Survey	Physicians	Within a family medicine group in the United States, oategories important
2006			a high level of care included teamwork, leadership, pattern centered care,
			quality improvement, accountability, and a sense of ownership.
Liebhaber &	Letter	Physicians	From 1996/97 to 2004/05, the proportion of physician in solo or 2 physici
	1	1	L by copyright.
			pyrigl

			BMJ Open 13
			BMJ Open practices decreased from 40.7% to 32.5% and physiciaas were increasingly
Grossman,			practices decreased from 40.7% to 32.5% and physicians were increasingly
2007			forming single specialty rather than multi-specialty group practices.
Lowes, 2007	Survey	Physicians	Primary care physicians in the United States were earning more money if
			they practiced within groups of more than 50 physicians.
Rivet et al.,	Survey	Physicians	Family physicians in solo practice had greater overall by satisfaction in this
2007			survey that primarily assessed improved satisfaction associated with
			performing procedures.
Zazzali,	Survey	Physicians	Stronger group culture emphasizing participation, tean work, and
Alexander,			cohesiveness promoted physician satisfaction. Conversely, a hierarchical
Shortell, &			structure had a negative effect on satisfaction.
Burns, 2007			
Masselink,	Survey	Physicians	Data from the Physician Worklife Survey found that geod relationships with
Lee, &			colleagues in a large group practice led to a decrease $in \delta^{3}$ a physician's intent t
Konrad, 2008			withdrawal from practice. A similar effect was not see for physicians in small or solo practices.
			small or solo practices.
Breon, 2009	Case Report	Physicians	After the establishment of a surgical group practice in $\frac{9}{2}$ and $\frac{9}{2}$
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			copyright.

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5			BMJ Open
			BMJ Open 36/bmjopen-202
		Healthcare Systems	surgeons the access to surgical care at multiple hospitals improved and sh
			call coverage was achieved.
Rodríguez &	Case Study	Physicians	A family medicine group in Quebec was assessed during its formation and
Pozzebon,		Allied health	difficulties with interpersonal and interprofessional relationships were
2010		Healthcare systems	identified and found to be quite detrimental to the functioning of the team
			new director was able to mend these relationships, improve communication
		Ne	and move the group forward.
Streu et al.,	Survey	Physicians	Working within a group practice led to increased job satisfaction for plast
2010			surgeons as they were less professionally isolated.
Koppula et	Interviews	Physicians	Group practices allowed family physicians to have a better work-life bala
al., 2011			collaboration, and support from fellow group members and allowed for
			continuity of care during and beyond the obstetrical $ext{exert}$ has a solution of the continuity of care during and beyond the obstetrical external transformation of the continuity of the c
			identified included sustainability (securing locum physicians to cover
			absences) and conflict within the group.
Rao et al.,	Survey	Physicians	Family physicians in the United States in solo practices were found to be
2011			likely to adopt electronic health records when compared to those in group
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			BMJ Open 60
			BMJ Open 300 pen 202 practices. 44
			practices.
Suchman A	Abstract	Physicians	Chronic conflict, behavioural accountability, and a congroup vision were
et al., 2011			addressed in a small group practice through regular magings, retreats, and a
			objective assessment by allied health professionals to improve group
			function.
Orton et al.,	Survey	Physicians	Higher rates of depersonalization were identified in Ges in the UK working
2012			in group practices vs solo practices which was felt to $begin{tabular}{c} \underline{g} \\ \underline{g}$
			interpersonal relationships as well as increased demands and less autonomy
Burns et al.,	Review	Physicians	Currently, part of the reason larger groups in the United States may be
2013			forming is because they are able to leverage insurers not effectively and
			build up more market share. Groups with over 100 physicians are increasing
Damiani et	Systematic	Patients	Greater uptake of health information technology in Greater uptake of health information technology information tec
al., 2013	Review	Physicians	compared to solo practices and a higher satisfaction with compensation was
		Healthcare Systems	noted.
Mosaly et al.,	Abstract	Physicians	Physicians who cross-cover patients may perceive that their workloads are
			increased, and performance decreased.

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ey Physicians ey Physicians ey Physicians ey Physicians ey Physicians	BMJ Open       Between 2009 and 2011, groups of greater than 100 physicians continued to increase in number, with a decrease in the number of solo practitioners.         Family physicians in solo or small practices were less fikely to adopt electronic health records compared to those in larger group practices.         Technical efficiencies were higher for group practices but this was also associated with higher costs compared to solo practices.         Hospital owned physician groups had higher costs than physician owned
onal Physicians Physicians Physicians Physicians	<ul> <li>increase in number, with a decrease in the number of solo practitioners.</li> <li>Family physicians in solo or small practices were less tikely to adopt electronic health records compared to those in larger group practices.</li> <li>Technical efficiencies were higher for group practices obut this was also associated with higher costs compared to solo practices.</li> <li>Hospital owned physician groups had higher costs that physician owned</li> </ul>
y Physicians ey Physicians ey Physicians - Physicians	Family physicians in solo or small practices were less       Skely to adopt         electronic health records compared to those in larger group practices.       Skely to adopt         Technical efficiencies were higher for group practices obut this was also       associated with higher costs compared to solo practices         Hospital owned physician groups had higher costs that physician owned       by the second
ey Physicians ey Physicians ey Physicians - Physicians	electronic health records compared to those in larger group practices. Technical efficiencies were higher for group practices but this was also associated with higher costs compared to solo practices Hospital owned physician groups had higher costs that physician owned
ey Physicians - Physicians	electronic health records compared to those in larger group practices. Technical efficiencies were higher for group practices but this was also associated with higher costs compared to solo practices Hospital owned physician groups had higher costs that physician owned
- Physicians	Technical efficiencies were higher for group practices but this was also associated with higher costs compared to solo practices Hospital owned physician groups had higher costs that physician owned
- Physicians	Associated with higher costs compared to solo practices Hospital owned physician groups had higher costs that physician owned
	Hospital owned physician groups had higher costs that physician owned
	<u> </u>
onal	groups in California between 2009 and 2012.
,	an.bmj.c
ey Physicians	Family physicians were less likely to pass the American Board of Family
	Medicine maintenance of certificate exam if they were $\underline{\underline{A}}$ in a solo practice
	which was thought to result from the ability to spend $\frac{1}{100}$ by the spend $\frac{1}{100}$ by t
	improvement and education within a group practice ( $O_{\mathbf{R}}^{\mathbf{F}} 0.48$ [95%CI 0.34
	improvement and education within a group practice (OR 0.48 [95%CI 0.34 0.68]).
ey Physicians	Working in a group practice was identified as a practice characteristic

			BMJ Open
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2014			associated with professional burnout in plastic surgeons and comments from
			the survey seemed to indicate that this was due to poor interpersonal
			relationships within groups.
Valentine et	Survey	Physicians	Surgeons working in solo practice were less likely to pass their maintenance
al., 2014		A C	of certification examination compared to those in group practices (OR 0.22
			[95% CI 0.06-0.77]).
Kralewski et	Survey	Physicians	Group practices that focus on improved screening and monitoring may
al., 2015			improve avoidable utilization, cost, and revenue.
Moosa et al.,	Survey	Physicians	GPs working in groups were more optimistic about the future compared to
2016			solo practitioners and worked fewer days but saw more patients per day.
Muhlestein &	Cross-	Physicians	Between 2013 and 2015, the largest changes in group practice size were a
Smith, 2016	sectional		decrease in small groups and an increase in very large groups of over 100
	Study		physicians. Groups of 100 or more increased from 29. 8% to 35.1%. Groups
			with 1-2 physicians decreased from 22.5% to 19.8%. $\frac{12}{9}$
Fryer et al.,	Survey	Patients	Improved utilization of emergency department and outpatient resources
2017			amongst patients with chronic illnesses in group practing who perceive a
			d by copyright.

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			BMJ Open 136/bmjopen-202
			higher level of integration.
Gisler,	Survey	Physicians	Young GPs in Switzerland prefer to work part-time in group practices of
Bachofner,			to 5 physicians.
Moser-			to 5 physicians.
Bucher,			•
Scherz, &		10r	Downloaded
Streit, 2017			ided from
Kwietniewski	Survey	Physicians	Costs of group practices were higher than those of sole practices due to r
et al., 2017			investment in technological costs that solo practices would not be able to
			afford.
Mazurenko et	Survey	Physicians	Solo physicians had less health information technology and had less ema
al., 2017			correspondence with patients and other physicians. $\frac{2}{2}$
Viehmann et	Survey	Physicians	Chronic stress was identified in 26.3% of German GPs and practice assis
al., 2017			with no difference observed between those in solo and $\frac{4}{2}$ group practices.
Baker et al.,	Survey	Patients	The use of HIT, care management processes, and quality improvement
2018		Physicians	processes increased over time, but only quality improvement processes w
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			yrigt

			BMJ Open	
			BMJ Open attributable to a larger group size. Additionally, no significant differen	
			attributable to a larger group size. Additionally, no significant differen	ces
			were seen in cost and quality between different group $\overset{\sigma}{\overset{\sigma}{\overset{\sigma}{\overset{\sigma}{\overset{\sigma}{\overset{\sigma}{\overset{\sigma}{\overset{\sigma}$	
Kwietniewski	Survey	Physicians	Group practices of all sizes and most specialties have been shown to h	ave
& Schreyögg,		~	more technical, cost, and profit efficiencies than solo $p_{x}^{\overline{b}}$	s was
2018		K. Or	thought to be due to the standardization of processes. $\frac{\aleph_1}{\nabla}$	
Noroxe et al.,	Survey	Physicians	More than half of Danish GPs reported at least one burnout symptom.	Those
2018			in group practices were less likely to report a poor work-life balance	
			compared to solo GPs.	
			compared to solo GPs.	
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Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist

SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
TITLE			
Title	1	Identify the report as a scoping review.	1
ABSTRACT			
Structured summary	2	Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	2
INTRODUCTION		· · ·	
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	4-5
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	5
METHODS			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	6
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	6
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	6
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	Supp App B
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	6-7
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	7
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	7
Critical appraisal of individual sources of evidence§	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate).	N/A
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	7



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SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED ON PAGE #
RESULTS			
Selection of sources of evidence	14	Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	8 Figure 1
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	8 Supp App A
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	N/A
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	8-14 Supp App A
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	8-14
DISCUSSION			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	15-17
Limitations	20	Discuss the limitations of the scoping review process.	18
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	18-19
FUNDING			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	19

JBI = Joanna Briggs Institute; PRISMA-ScR = Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews.

\* Where *sources of evidence* (see second footnote) are compiled from, such as bibliographic databases, social media platforms, and Web sites.

† A more inclusive/heterogeneous term used to account for the different types of evidence or data sources (e.g., quantitative and/or qualitative research, expert opinion, and policy documents) that may be eligible in a scoping review as opposed to only studies. This is not to be confused with *information sources* (see first footnote).

<sup>‡</sup> The frameworks by Arksey and O'Malley (6) and Levac and colleagues (7) and the JBI guidance (4, 5) refer to the process of data extraction in a scoping review as data charting.

§ The process of systematically examining research evidence to assess its validity, results, and relevance before using it to inform a decision. This term is used for items 12 and 19 instead of "risk of bias" (which is more applicable to systematic reviews of interventions) to include and acknowledge the various sources of evidence that may be used in a scoping review (e.g., quantitative and/or qualitative research, expert opinion, and policy document).

From: Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMAScR): Checklist and Explanation. Ann Intern Med. 2018;169:467–473. doi: 10.7326/M18-0850.



# **BMJ Open**

# Group Practice Impacts on Patients, Physicians, and Healthcare Systems: A Scoping Review

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Group Practice Impacts on Patients, Physicians, and Healthcare Systems: A Scoping Review

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# ABSTRACT

Objective: To identify the advantages and disadvantages that group practices have on patients, physicians, and healthcare systems.

Study design: A scoping review was performed based on the methodology proposed by Arksey and O'Malley, and refined by Levac and colleagues. Titles and abstracts were screened by two reviewers. A quantitative analysis was performed to assess the type, year, and region of publication as well as the population studied. A qualitative descriptive analysis was performed to identify common themes.

Study setting: MEDLINE, EMBASE, and Cochrane databases were searched from database inception to October 2018 for papers which assessed outcomes relevant to the research question. Results: Our search strategy returned 2408 papers and 98 were included in the final analysis. Most papers were from the United States, were surveys, and assessed physician outcomes. Advantages of group practices for patients included improved satisfaction and quality of care. Studies of physicians reported improved quality of life and income, while disadvantages included increased stress due to poor interpersonal relationships. Studies of healthcare systems reported improved efficiency and better utilization of resources.

Conclusions: Group practices have many benefits for patients and physicians. However, further work needs to be done assessing patient outcomes and establishing the elements that make a group practice successful.

Strengths and limitations of this study:

- This was a large, comprehensive overview of group practices from many countries
- The scoping review methodology allowed us to assess a wide variety of papers and identify key gaps in the knowledge for further study
- Patient engagement was instrumental on focusing this review on patient outcomes and areas for improvement
- This review was limited by language restrictions, heterogeneity of the data, and possible publication bias

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#### **INTRODUCTION**

Group practices have existed for over 100 years with one of the first groups set up by the Mayo brothers in the mid-1880s<sup>1</sup>. This group was eventually transformed into a large organization that has been recognized as a center of excellence leading to benefits for patients and physicians. Following their success, group practices became more and more common, and currently, many physicians around world are practicing within groups or partnerships<sup>2–5</sup>. Sizes of group practices vary dramatically, from 2 physicians to over 100 physicians, and there is no standard definition of what defines a group. Over the years many papers have been published on group practice formation assessing various advantages and disadvantages for patients, physicians, and healthcare systems as well as the impetus behind their development. The economic benefits of these groups and the improvements in service provision to patients is supported by the literature and has been well documented<sup>3,6–8</sup>. Barriers to the formation of group practices, or conflicts that can result from group practices have also been considered and often have to do with interpersonal relationships<sup>9–12</sup>. The extent of literature spans many decades and provides an excellent overview of how group practices have evolved and the effects which they have had on patients, physicians, and healthcare systems.

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Patient care can be significantly altered by the formation of group practices, and it is important to consider this impact as groups are often formed for reasons that are not directly related to patient care<sup>11,13–15</sup>. Some of these other reasons include the benefits realized by physicians with regards to income, quality of life, satisfaction, and decreased physician burnout, which is estimated to affect more than half of physicians <sup>9,16–19</sup>. Group practices also may be developed due to healthcare system incentives, or as a way to improve the income and efficiency of physicians within a given system<sup>14,20–23</sup>. This again may not be directly related to patient care

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but may have impacts on the quality of care and its timeliness. Whatever the motivation for forming group practices, it is important to assess the effects on all involved stakeholders to ensure that this is a step in the right direction for the patients that healthcare providers are committed to serve, the wellbeing of physicians, and the sustainability of the systems which healthcare providers work within.

There has been a paucity of literature that synthesizes the knowledge published regarding group practices. A systematic review published in 2013 assessed the effectiveness of group versus solo practice amongst general practitioners (GPs) and demonstrated a positive association between group practices and clinical processes, physicians opinions, and innovation, but did not observe any effect for patient measures<sup>7</sup>. A recent review has also attempted to establish a definition for group practices and the overall shift towards their development<sup>24</sup>. The objectives of this study were to review the literature for evidence that assesses the advantages and disadvantages that group practices have on patients with regards to quality of care and satisfaction; physicians with regards to team dynamics, income, and satisfaction; and the financial impact on healthcare systems. A scoping review was performed as we expected to identify heterogenous studies with a wide range of outcomes focused on patients, physicians, and healthcare systems. A broad overview of the literature was desired to identify current knowledge gaps and guide further studies.

#### METHODOLOGY

A scoping review was performed according to the methodology proposed by Arksey and O'Malley, and refined by Levac and colleagues<sup>25,26</sup>. The PRISMA extension for scoping reviews (PRISMA-ScR) checklist was used to ensure all relevant aspects of a scoping review were included<sup>27</sup>. The following research question was developed:

What advantages and disadvantages do group practices have for patients, physicians, and healthcare systems?

A complete scoping review protocol was developed and published<sup>28</sup>. The following stages were incorporated into this scoping review according to what is suggested by Levac et al.: identifying the research question; identifying relevant studies; study selection; charting the data; collating, summarizing, and reporting results; and consultation. Full details on each stage can be found in the published protocol<sup>28</sup>. Briefly, MEDLINE, EMBASE and Cochrane Central were searched from database inception to October 2018 to identify relevant studies that assess the impact of group practices on patient care, satisfaction, and outcomes; physician quality of life, satisfaction, and income; and healthcare system finances. There were no restrictions placed on publication date. The grey literature was not searched as originally indicated in the protocol due to an adequate number of peer-reviewed articles which met inclusion criteria from the databases. The search strategy was peer reviewed according to the formal process outlined by McGowan et al<sup>29</sup>. The search strategy is included in Appendix A.

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Three members of the research team met to perform a calibration exercise and review 10 papers to pilot the screening and full text data extraction forms. Titles and abstracts were subsequently screened independently by two reviewers and the abstraction results from the full text articles were charted and verified by the same two members. Disagreements were resolved by discussion between the two reviewers as well as input from other authors of the paper. We included papers that:

- Included patients receiving, and/or clinicians providing care within any type of group practice (Population)

- Assessed the advantages and/or disadvantages of group practices (Concept)

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We examined all papers from group practices in all areas of medicine which reported outcomes relevant to patients, clinicians, or health system stakeholders (Context). Papers were excluded if they were not published in the English language.

DistillerSR (Evidence Partners, Ottawa, Canada) was used for screening and data extraction. A standardized form was created and tested on 10 papers by three members of the research team. We did not deviate from the protocol and charted authors, year of publication, country of origin, objectives, type and size of group practice, population studied (patients, physicians, etc.), sample size, methods and type of study, interventions, outcomes, and key findings<sup>28</sup>. This standardized form was used throughout the study and no changes were required after it was tested. We extracted and summarized included paper characteristics including type of study, year, region of publication, and the population studied. A qualitative analysis was also performed using a qualitative descriptive approach from the key findings of the selected papers<sup>30</sup>. A coding manual was created and codes were applied to the key findings. These were refined as the study progressed and grouped into themes. This was performed in parallel by two reviewers who then met to discuss the results and corresponding themes. After a conventional content analysis, common themes were grouped by:

1) patient care, including satisfaction and quality of care

2) physicians, including quality of life, competency, group dynamics, group characteristics, and financial impacts

3) healthcare system issues relating to financial impacts

A detailed quality assessment was not performed due to the heterogeneity of the data and the general principles of a scoping review<sup>26</sup>. During the scoping review process, we consulted with four surgeons from other group practices to ensure that the review was comprehensive and

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that all relevant papers were included. These surgeons were known by the research group to be participants in group practices.

#### Patient and Public Involvement

A patient advisor was recruited from the Department of Patient Relations as part of the research team. As practice organization directly impacts on patients, it was essential that we had patient input into the design of the study and the analysis of the data. The patient advisor collaborated with the team and ensured that the research question and outcomes were applicable to patients and reviewed the final draft of the paper<sup>31</sup>.

#### RESULTS

Using the search strategy outlined in Supplementary Appendix A, 2408 papers were identified. Of these, 35 were excluded as duplicates and 2373 titles and abstracts were screened. After screening, 149 full text articles were examined and 98 met inclusion criteria. Of those excluded, 34 did not assess advantages or disadvantages of group practices, 5 papers focused on multidisciplinary groups, 2 papers were based on a previous paper and did not provide any new data, and 1 paper assessed a dental group practice. We were unable to obtain full text articles for 9 papers. The PRISMA flow diagram in Figure 1 displays these results.

The majority of papers were from the United States (58%), followed by Europe (19%), and then Canada (15%). There were only a handful of papers from elsewhere in the world (7%). Papers frequently included more than one type of group practice. Family medicine was reported on most commonly (76%), followed by surgical practices (43%), and all others (36%). Physicians (94%) were the focus of almost all the papers rather than patients (26%), allied health (4%), or healthcare systems (10%). Some papers touched on multiple populations. Most of the

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included papers were surveys (63%). Group practices have been published on dating back until at least the 1960s. Recurring themes were evident over the years and are expanded on in the qualitative analysis. See Table 1 for a full description of included papers.

#### Table 1 - Selected Paper Characteristics

Jnited States Europe	56 (57%) 20 (20%)
0	20 (20%)
Canada	
	16 (16%)
Dther	7 (7%)
amily Medicine or General	74 (76%)
Practitioner	
Surgical	42 (43%)
Dther	35 (36%)
Physicians	92 (94%)
Patients	25 (26%)
Healthcare Systems	10 (10%)
Allied Health	4 (4%)
	amily Medicine or General ractitioner urgical other hysicians atients lealthcare Systems

Type of Publication	Survey	62 (63%)
	Letter	7 (7%)
	Case Report	6 (6%)
	Cohort Study	5 (5%)
	Abstract	2 (2%)
	Case Series	2 (2%)
	RCT	2 (2%)
	Systematic Review	2 (2%)
	Other	10 (10%)
Publications by Decade	1960-1969	6 (6%)
	1970-1979	9 (9%)
	1980-1989	5 (5%)
	1990-1999	9 (9%)
	2000-2009	23 (23%)
	2010-present	46 (49%)

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## Group Practices Improve Patient Satisfaction and Experience

Sources that addressed patient outcomes are listed in Supplementary Appendix B. Six of these provided evidence that group practices can result in improvements in patient satisfaction<sup>23,32–35</sup>. Four of these sources were surveys that assessed changes in satisfaction after the implementation or expansion of a group practice. This sense of satisfaction appeared to be most commonly due to better perceived access to care and quality of care. In contrast to this, one survey from 1975 identified a negative effect on patient satisfaction and experience<sup>36</sup>. The Patient Perceptions of Integrated Care survey identified that patients with multiple chronic diseases who perceive a higher level of integration within a group will utilize less emergency department and outpatient resources<sup>37</sup>.

#### Patient Quality of Care

The aspects of quality of care assessed by the papers included access to care, continuity of care, prescribing techniques, adherence of the physicians with established clinical guidelines, frequency of consultations, and unnecessary investigations and treatment. Twenty-two sources either identified an improvement in patient quality of care associated with group practices or a negative impact on patient quality of care. Two sources did not identify any differences in patient quality of care based on practice organization<sup>38,39</sup>.

### Group Practices Improve Patient Quality of Care

Twenty-two sources demonstrated improvements in patient quality of care. This included objective measures with quality of care scores as well as patient perception as captured by surveys. Group practices were found to improve access to care, comprehensiveness, waiting times, time spent with patients, efficiency, patient safety, and utilization of resources according to patient reported outcomes<sup>6,8,33,40–48</sup>. Patients perceived a higher quality of care with group

practices with regards to tangibles (equipment and facilities), reliability, responsiveness, assurance, and empathy<sup>49</sup>. Physicians in group practices had higher quality of care scores and adherence to guidelines was found to be better due to increased knowledge sharing and access to information<sup>35,44,50,51</sup>. Improvements in appropriate prescribing techniques were also associated with physicians working in group practices<sup>7,52</sup>. Physicians in group practices were also more likely to consult peers<sup>53</sup>. More patient-centered medical home processes within a practice were associated with larger groups compared to solo and small group practices (1-2 physicians), although all types of practices have shown modest increases over time<sup>54,55</sup>. However, a recent paper based on large surveys found no improvements in quality measures based on practice size<sup>56</sup>.

## Group Practices Negatively Impact Patient Quality of Care

Six sources noted some negative impacts with group practices on patient quality of care. This included worse continuity of care and dilution of the patient-doctor relationship<sup>41,57</sup>. Group practices have also been found to order more investigations or treat inappropriately if there was a financial benefit<sup>8,58,59</sup>. Additionally, a primary care internist who moved from a small practice to a large group practice after many years perceived that the level of care he was providing was compromised by the large group and payers setting targets for the group<sup>60</sup>. BMJ Open: first published as 10.1136/bmjopen-2020-041579 on 8 January 2021. Downloaded from http://bmjopen.bmj.com/ on April 17, 2024 by guest. Protected by copyright

#### Physician Quality of Life, Satisfaction, and Burnout

Papers which assessed physician outcomes are listed in Supplementary Appendix B. Twenty papers assessed the relationship between group practices and physician quality of life, satisfaction, and burnout. Two papers did not find any significant difference in this area for group and solo practices<sup>61,62</sup>. Two main themes were identified from the sources including the

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following: group practices improve physician quality of life and satisfaction, and group practices lead to conflict and additional stress for physicians.

## Group Practices Improve Physician Quality of Life and Satisfaction

Group practices were often found to improve the work-life balance and job satisfaction of physicians when compared to solo practices<sup>9,19,63–67</sup>. Being a member of a group practice led to less professional isolation, improved knowledge sharing, and an improvement in professional development<sup>9,19,68</sup>. Improved attitudes about group practices in the Netherlands were related to an increased desire for contact and cooperation with other physicians<sup>69</sup>. Satisfaction with personal and lifestyle factors and optimism for the future was increased amongst physicians in group practices<sup>70,71</sup>. Group practices were also associated with a decreased call burden and increased cross coverage of patients which directly impacts the quality of life for most physicians and their families<sup>6,68</sup>. Due to the aforementioned benefits, group practices have also been noted to improve retention and recruitment initiatives, especially in rural or underserviced areas<sup>68,72</sup>. Group Practices Lead to Conflict and Additional Stress for Physicians

Seven sources have identified issues with group practices that create conflict and additional stress for physicians. These center around the interpersonal relationships of the group members and sustainability<sup>63</sup>. Poor interpersonal relationships lead to lower job satisfaction and a higher degree of professional burnout<sup>73,74</sup>. Three papers identified that group practices were also associated with increased physician demands, decreased performance, and reduced autonomy<sup>74–76</sup>. A large survey of family physicians in Canada found that physicians in solo practice had more job satisfaction than those in group practices in a survey that was primarily assessing improved satisfaction with performing procedures<sup>77</sup>.

## Group Practices Improve Physician Competency

Two papers addressed differences in physician competency<sup>78,79</sup>. Family physicians and surgeons were found to be less likely to pass their respective maintenance of certification exams if they were in a solo practice. This was thought to result from the ability to spend more time on quality improvement and education within a group practice.

## Facilitators and Barriers Associated with Working in a Group Practice

An important theme that arose during analysis was the identification of barriers and facilitators associated with forming or maintaining a group practice. These characteristics have direct impacts on patient care and physician quality of life, job satisfaction, and burnout. Eight sources identified these characteristics and they are summarized in Table 2<sup>10,12,22,80–84</sup>. Table 2 - List of Barriers and Facilitators for Group Practices

Facilitators	Barriers
Teamwork <sup>81,82</sup>	Incompatible personalities <sup>10,22</sup>
Leadership <sup>22,81</sup>	Poor leadership <sup>12</sup>
Common vision <sup>84</sup>	Different visions for the group <sup>12</sup>
Patient centred care <sup>81</sup>	Disagreements about re-imbursement <sup>12</sup>
Quality improvement <sup>81</sup>	Legal and real estate issues <sup>10</sup>
Accountability <sup>81</sup>	Dissatisfied office staff <sup>12</sup>
Sense of ownership <sup>81</sup>	Fears about loss of autonomy <sup>80</sup>
Sense of responsibility <sup>82</sup>	
Cohesiveness <sup>82,83</sup>	

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## Group Practices Lead to Higher Incomes for Physicians

Seven sources from the United States, Taiwan, and South Africa have identified increased individual earnings for physicians practicing within group practices<sup>15,21,71,85–88</sup>. Physicians in group practices have also been shown to be more satisfied with their compensation. A letter published in 1968 highlighted income deferral by physicians until later in life when they were less productive as an additional benefit of group practices<sup>89</sup>. Currently, larger groups may be forming in the United States as they are able to leverage insurers more effectively and build up more market share<sup>3</sup>.

## Costs of Group Practices are Higher than Solo Practices

Costs of group practices have been found to be higher than those of solo practices<sup>20,90,91</sup>. This may be due to more investment in technological costs that solo practices would not be able to afford<sup>20,91</sup>. Some large group practices may also be more inefficient than solo or small group practices<sup>92</sup>.

## Group Practices May Improve the Uptake of Health Information Technology

Physicians practicing in groups are more likely to have greater access to health information technology (HIT) and were also more likely to correspond with their patients and other providers via email<sup>7,93</sup>. Family physicians in the United States in solo practices were found to be less likely to adopt electronic health records when compared to those in group practices<sup>94,95</sup>. Data from two large surveys indicated a general trend towards increased use of HIT over time, but did not see a clear association between group size and an increased use of HIT<sup>56</sup>.

More Physicians are Practicing in Group Practices and Group Practices are Increasing in Size

Many sources have tracked the rise in the number and type of group practices over the years (Supplementary Appendix B). The definition of a group practice is very heterogenous in

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the literature and previous work has been done in an attempt to classify groups<sup>24</sup>. Often, groups of 1-19 physicians are classified as small or medium (further subclassified into groups of 1-2, 3-7, 8-12, and 13-19), and groups of 20 or more are classified as large (further subclassified into groups of 20-99 and >100).<sup>54,55</sup> The included papers show an increase in the absolute number of group practices and their sizes over the years.

In 1968, group practices were mostly limited to hospitals with most other physicians working in solo practices outside of the hospitals, and it was believed that group practices would not be taken up unless it was established as a desirable form of practice to society and health care professionals<sup>96,97</sup>. Now, in the United States, more physicians across all specialties are forming or joining larger groups and groups of more than 100 physicians which usually have non-physician owners, have grown rapidly in recent years<sup>2–4</sup>. This increase has been driven by the benefits group practices can offer physicians<sup>11,13,98–101</sup>.

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Despite having a very different healthcare system, group practices have also grown in Canada. In 1970, 57% of graduating physicians entered a group practice or partnership, 21% entered solo practice, and 22% became salaried physicians. Surgeons and psychiatrists were most likely to enter solo practice<sup>5</sup>. A survey of Canadian physicians in 1987 found that around half of the physicians were in either solo or group practices and the other half had some group practice arrangements for financial benefits<sup>14</sup>. Government support was seen as a key factor in establishing group practices<sup>14,102</sup>.

## Group Practices May Help Reduce Costs Within Healthcare Systems

Group practices have the potential to impact healthcare systems financially, with respect to access to care, and appropriate utilization of healthcare resources. Sources have shown that group practices of all sizes and most specialties have been shown to have more technical, cost,

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and profit efficiencies than solo practices (Supplementary Appendix B)<sup>103,104</sup>. This is thought to be due to the standardization of processes<sup>104</sup>. Group practices that focus on improved screening and monitoring may improve avoidable utilization, cost, and revenue<sup>103</sup>. A higher level of integration perceived by patients with chronic illnesses also reduces utilization of emergency department and outpatient resources<sup>37</sup>. Income pooling within an obstetrical call group in a Canadian study led to decreased rates of elective induction of labour in a before and after study<sup>105</sup>. Older data from the Physicians' Practice Cost and Income Survey in 1986 found no significant differences in practice efficiency between solo and group primary care practices in the United States<sup>106</sup>. Additionally, a recent paper which included data from large surveys found that group size was not associated with an improvement in spending or quality<sup>56</sup>.

## DISCUSSION

We were able to identify themes associated with the advantages and disadvantages that group practices have for patients, physicians, and healthcare systems. It is important to note that the term 'group practice' refers to a broad range of practice types within the literature and there is no clear definition with respect to the critical pieces that define what a group practice is beyond the number of physicians and inclusion of one or more specialties. Organizations in the United States such as the America's Physician Groups, and American Medical Group Association have been developed to represent physicians in various types of groups. Groups may be defined as single specialty with two or more physicians or multispecialty with any number of different specialties providing care to patients.

Themes involving patients included satisfaction and quality of care. Generally, patients seemed to be more satisfied with care that was being received from physicians in group

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practices<sup>23,32,33,40</sup>. From these studies, this appears to be due to increased access to care and decreased waiting times. Although continuity of care would seem to be a legitimate concern with a group practice as patients may be seeing different physicians on any given day, this was actually shown to be improved in one study<sup>23</sup>. Concerns surrounding continuity of care were raised in one study which addressed non-adherent patients in a group practice<sup>57</sup>. Furthermore, in a situation that is unique to a surgical group practice, patients did not seem to be concerned by the fact that they might not meet the surgeon who is operating on them until the day of their operation as they had confidence in any of the surgeons associated with the group<sup>33</sup>.

While it is important that patients are satisfied with the care they are receiving, it is imperative that they also receive high quality care. Overall, most papers indicated that the quality of care increased with a group practice structure as measured objectively and subjectively. Adherence to guidelines and appropriate prescribing was better with group practices and quality of care scores improved<sup>7,51,52</sup>. There were some notable exceptions including using radiation therapy for prostate cancer when it was not necessarily indicated because the group owned radiation facilities, and the increased use of laboratory investigations offered by the group<sup>15,58,59</sup>. This may have been driven by convenience as well as financial gain.

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Overall, patients appear to benefit from group practices through improved quality of care, access, and satisfaction. The data surrounding the impact of group practices on patients was presented in 24% of papers. This has been identified as an area for further research as we know that group practices are often formed to primarily benefit the physicians working within them<sup>6,68,72</sup>.

Numerous advantages of group practices for physicians have been identified from this scoping review. They include increased quality of life and satisfaction, decreased burnout, higher

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competency, and financial gain. More attention has been paid to physician burnout in recent years as the prevalence is surprisingly high<sup>17,18</sup>. Improving the quality of life and job satisfaction for physicians may help with this and group practices have the potential to help in these areas. Overall, most of the literature included in this review shows a positive association with group practices and physician quality of life and job satisfaction. These improvements result from a better work-life balance, shared call responsibilities, improved knowledge transfer, collaboration, and decreased professional isolation<sup>6,9,63,66</sup>. Physicians in solo practices may still be able to pursue similar opportunities but may face logistical challenges due to isolation.

A notable area of decreased satisfaction results from poor interpersonal relationships<sup>12,22</sup>. This can lead to the collapse of a group and highlights the need for group practice members to be compatible and share a common vision, especially if they are financially integrated. As groups become larger and larger, especially in the United States where groups of more than 100 physicians are not uncommon, relationships can become less collegial and autonomy may be lost<sup>80</sup>. The importance of regular meetings with a shared sense of ownership and responsibility has been shown to be very important to group function and quality of care<sup>81,84</sup>. Therefore, although groups have the potential to improve job satisfaction and quality of life for physicians, it depends on the overall functioning of the group and compatible personalities within the group for this to be achieved.

In the two papers assessing the level of physician competency (based on whether or not physicians were members of group practices) the overall impact seems to be positive with improved scores on certification exams<sup>78,79</sup>. This is thought to be due to more knowledge transfer between group members and less professional isolation. The ability to approach and consult

colleagues relatively easily about difficult or interesting clinical questions has the potential to enhance the learning of all group members and improve patient care.

Financially, group practices have been shown to improve incomes of physicians. This is most relevant in the United States where groups are often formed to gain negotiating leverage with payers<sup>11,13</sup>. However, individual incomes also seem to be higher in other areas of the world such as New Zealand, South Africa, and Taiwan<sup>71,86,87</sup>. The increased income may help offset costs associated with investments in equipment or technology that would not be feasible for solo physicians.

The impact of group practices on healthcare systems can be seen in improvements in access to care, system efficiencies, improved use of resources, and adherence to guidelines. Some exceptions to this may include inappropriate use of resources if there is a financial gain. Moving forward, this will be an important area of study as there are many different health care systems in place around the world. BMJ Open: first published as 10.1136/bmjopen-2020-041579 on 8 January 2021. Downloaded from http://bmjopen.bmj.com/ on April 17, 2024 by guest. Protected by copyright

This scoping review has allowed us to identify gaps in the literature which can be addressed in the future. As demonstrated above, patient care is often not the focus of research into group practices. This needs to be addressed to ensure that we are improving the service that is being delivered to the end user, namely, the patient. Creating a shared or group practice is often beneficial to physicians, but if the patient experience or quality of care is negatively impacted, this needs to be understood. Additionally, it was difficult to separate different types of group practices in the literature. The definition of a group practice varies significantly and includes anywhere from 2 to >100 physicians and/or allied health care providers<sup>24</sup>. This makes comparisons difficult. However, this scoping review has allowed us to perform a high level overview of all types of group practices and in an attempt to identify all characteristics which are

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important to patients and physicians. The knowledge gaps we identified with respect to this issue includes a group practice definition and which elements contribute to a successful practice which benefits patients and physicians.

As part of the scoping review process, key stakeholders were consulted regarding this review. They included a patient advisor and members of other group practices. The patient advisor was included in the design of this study, verified the results, and reviewed the final draft of this manuscript. Other group practice members verified the results by reviewing the themes and included references, ensuring that all relevant papers were included. The patient advisor and group practice members will help to guide further research in the future. Some of the authors of this paper are group practice members and will be using their practice for research that will focus on patient outcomes including quality of care and satisfaction, as well as physician outcomes including quality of life, satisfaction, and burnout with guidance from this scoping review.

There are inherent limitations with a scoping review. This was meant to be a broad overview of the available literature and as such, the data are heterogenous and does not lend itself well to a quality assessment. There may very well be a publication bias with this topic as authors may only be inclined to publish on group practices that have worked very well. We were unable to obtain the full text for 9 papers. The included papers were also from many different regions and therefore, the conclusions may not be applicable to a particular country or region, however the objective of this review was to assess the advantages and disadvantages of group practices and common themes were identified that likely transcend many regional differences.

#### CONCLUSION

A group practice structure has many advantages for patients and physicians alike. Although the data is somewhat limited for patients compared to physicians, this scoping review

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has shown that there is a generally positive patient experience with some evidence of improved quality of care. There is also an increase in physician satisfaction and quality of life in groups that function well with compatible personalities. This scoping review has summarized the available literature based on our research question and has allowed us to identify two interesting areas of future investigation. First, it will be important to define exactly what the critical elements of a group practice are beyond the number of physicians as there is no standard definition that we were able to discern in this scoping review. This may then be used to guide the development of functional groups that are able to improve care and quality of life for both patients and providers. Second, although most of the available literature is directed towards the impact of group practices on physicians, addressing patient outcomes and perspectives is essential. This has been addressed in the literature more recently, and is an area which should be further developed. CONFLICT OF INTEREST The authors declare that there is no conflict of interest.

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## DATA AVAILABILITY STATEMENT

All data used are included in the article and supplementary appendices.

## CONTRIBUTORS

HM, TZ, DM, and FB conceived the study. TZ and HM drafted the protocol and developed the research question. TZ and SA performed the title and abstract screening and full text data extraction. TZ, HM, JB, TW, and SR contributed to the thematic analysis and interpretation of the data. All authors read and approved the final manuscript. HM is the guarantor.

## FIGURE LEGEND

Figure 1 - PRISMA flow diagram for screened and included papers.

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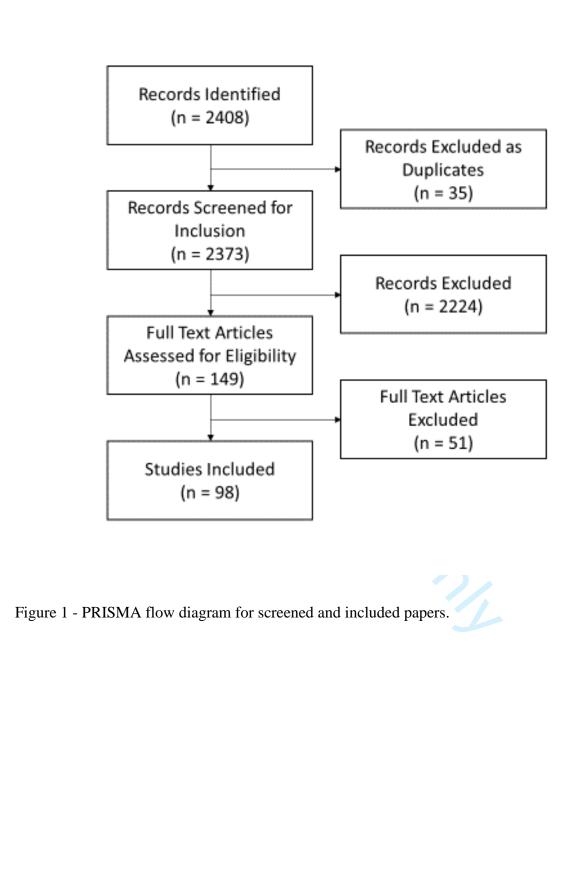
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6	Search Strategy:
7	
8	1 Group Practice/ (16988)
9	2 (group practice* or group medical practice* or group model or group models).tw. (14652)
10	3 1 or 2 (26886)
11	4 physicians/ or allergists/ or anesthesiologists/ or cardiologists/ or dermatologists/ or
12	endocrinologists/ or gastroenterologists/ or geriatricians/ or nephrologists/ or neurologists/ or
13	oncologists/ or radiation oncologists/ or ophthalmologists/ or otolaryngologists/ or pediatricians/ or
14	neonatologists/ or pulmonologists/ or radiologists/ or rheumatologists/ or surgeons/ or neurosurgeons/ or orthopedic surgeons/ (443392)
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17	neurolog* or obstetric* or oncolog* or ophthalmolog* or otolaryngolog* or patholog* or
18	p?ediatrician* or neonatolog* or physiatr* or pulmonolog* or orthop?ed* or radiolog* or
19	rheumatolog* or surgeon* or neurosurgeon* or urolog* or general practitioner*).tw. (5716273)
20	6 general practitioners/ or physicians, family/ or physicians, primary care/ or Primary Health
21	Care/ (224656)
22 23	7 (general practitioner* or family physician* or primary care physician*).tw. (170297)
23	8 physician*.ab. /freq=3 (121030)
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27	<ul> <li>11 (group physician* or group surgeon*).tw. (683)</li> <li>12 10 or 11 (8258)</li> </ul>
28	13 income/ or exp pensions/ or remuneration/ or exp "salaries and fringe benefits"/ (144814)
29	14 prognosis/ or exp treatment outcome/ (3037613)
30	15 "Outcome Assessment (Health Care)"/ (306264)
31	16 personal satisfaction/ or job satisfaction/ (99372)
32	17 exp Patient Satisfaction/(191942)
33	18 (satisfaction or patient reported outcome*).tw. (275754)
34	19 "Quality of Life"/ (522787)
35	20 "quality of health care"/ or quality assurance, health care/ (297926)
36	21 (income or salary).tw. (205853)
37	22 Life Style/ (134714) 23 life style.tw. (24521)
38	<ul> <li>23 life style.tw. (24521)</li> <li>24 lifestyle.tw. (167173)</li> <li>25 quality.mp. (2447101)</li> <li>26 Stress, Psychological/ (166129)</li> <li>27 Burnout, Professional/ (18655)</li> <li>28 (burpout or stress) tw. (1383633)</li> </ul>
39	25 quality.mp. (2447101)
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41	27 Burnout, Professional/ (18655)
42	28 (burnout or stress).tw. (1383633)
43 44	29 perception of care.tw. (479)
44	30 models, organizational/ (62847)
45 46	31 organi?ation* model*.tw. (2367)
47	32 Physician-Patient Relations/ (177062)
48	33 (patient adj2 physician adj3 relation*).tw. (7804)
49	<ul> <li>34 (revenue* or profit or profits).tw. (52523)</li> <li>35 insurance, health, reimbursement/ or reimbursement mechanisms/ or reimbursement,</li> </ul>
50	incentive/ (73589)
51	36 or/13-35 (7492929)
52	37 12 and 36 (3422)
53	38 group practice*.ti,kw. or (group medical practice* or medical group practice*).tw,kw. (4213)
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Supplementary	Appendix B		BMJ Open 36/bmjopen-2020-041579 on 8
Table 1 - Paper	rs Assessing Pat	ient Outcomes	579 on 8
Author	Study Design	Population Studied	Key Findings
Sellers, 1965	Retrospective	Patients	More laboratory investigations and consultations for group practice patients
	cohort study	Physicians	and patients report more personal attention and in-dependent explanations of a
		De	diagnosis and treatment by physicians in solo practice $\frac{1}{2}$
Graham,	Review	Physicians C	Limited evidence shows improvement in accessibility gcontinuity, quality, and
1972			efficiency with group practices. Potential drawbacks included dilution of the
			doctor-patient relationship and less autonomy.
Ritchey, 1975	Survey	Patients	Patients with solo GPs have better relationships with their physicians. Patients
			with GPs in group practice have greater unmet needs. $g > b$
Roos, 1980	Retrospective	Physicians	Quality of care and productivity were not found to be different for physicians
	Cohort study		in solo vs group practices in Manitoba.
Cohen et al.,	RCT	Patients	Patients were randomized to a new group practice model and found no
1986		Physicians	changes to patient satisfaction but there was a decreased in charges and
		Allied Health	utilization for patients as well as improved access to $care, and decreased$
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			waiting times.
Kuyvenhoven	Survey	Patients	GPs in the Netherlands were surveyed and 20% of solog physicians stated that
et al., 1990		Physicians	they never consulted their peers, while those working $\frac{1}{2}$ a group practice did
			so regularly, which was found to help improve the level of attention paid to
		K .	somatic complaints.
Gawande &	Survey	Patients	Patient satisfaction increased following the expansion $\frac{1}{2}$ f a group practice from
Benroth,		Physicians	18 to 36 orthopedic surgeons in Indianapolis. This was
1999			decreased waiting times and increased time spent with a surgeon.
Campbell et	Survey	Patients	Solo GP practices have shorter consultation lengths (10.2 min) vs group
al., 2001		Physicians	practices (17.8 min).
		Healthcare Systems	
Lin et al.,	Survey	Patients	Patients perceive better overall quality of care in primary care group practice
2004			compared to solo practices with regards to equipment, gacilities, reliability,
			responsiveness, assurance, and empathy.
Orrantia,	Case Report	Patients	A family group practice that was established in Marathon, Ontario allowed for $\underline{J}$
2005		Physicians	the maintenance of a stable number of physicians and $\frac{3}{2}$
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	BMJ Open		BMJ Open
			BMJ Open BMJ Open 202
			increased health care services offered to the community.
Ashworth &	Survey	Patients	Group practices obtained significantly higher Quality and Outcomes
Armstrong,		Physicians	Framework scores in the UK when compared to solo $p_{\underline{s}}^{\underline{\omega}}$ actices.
2006		$\mathbf{\wedge}$	luary 20
Breon, 2009	Case Report	Physicians	After the establishment of a surgical group practice in Fural Iowa by five
		Healthcare Systems	surgeons the access to surgical care at multiple hospitates improved and share
		Ne	call coverage was achieved.
Gaal et al.,	Survey	Physicians	Larger primary care practices in Europe were found to have more patient
2010			safety features present, but clinical outcomes were not
Tourigny et	Survey	Patients	Patient perception of continuity of care increased, accessibility remained th
al., 2010			same, and physician co-ordination with specialists decreased in this before
			after study following implementation of group practices in Quebec.
Weeks et al.,	Cross-	Patients	Large multispecialty group practices enrolled with the Council of Accounta
2010	sectional		Physician Practices delivered better quality of care at $\frac{1}{2}$ lower cost than other
	Study		Physician Practices delivered better quality of care at slower cost than other groups.
Rittenhouse	Survey	Patients	Larger groups used more patient-centered medical home processes than sol
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who moved from a small practice to a large $g$
s found that the level of care $h_{\underline{s}}^{\overline{\infty}}$ was providing
ge group and payers setting targets for the grou
s seen in a group practice herija clinic, most
h any surgeon from the group $\frac{3}{2}$ erforming thei
In't met them until the day of $\frac{a}{s}$ in the second se
or more efficient use of resources.
positive impacts on prescribing appropriatenes
es. Other quality measures we found to have
the included papers.
group practices were associated with better ac
s, and disease prevention. Consinuity of care w
4 by gue
p practices (> 10 physicians) $\frac{10}{2}$ the United Sta
aiting times by 14 minutes for the strength of

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			BMJ Open
			BMJ Open 136/bmjopen-20
Mehrotra et	Cross-	Patients	Patients in integrated medical groups received higher quality care based on 6
al., 2013	sectional		quality measures compared to independent practice as sociations. The self-
	Study		reported use of electronic medical records was higher as well.
Perkins et al.,	Survey	Physicians	Obstetricians and Gynecologists in the United States are more likely to adher
2013			to established cervical cancer prevention guidelines if they are part of a group
			practice, possibly because of improved knowledge shaping and access to
		K	information.
Pichetti et al.,	Survey	Physicians	In France, those who work in groups were more likely to prescribe multiple
2013			sourced rather than patented statins than solo practition
Visca et al.,	Survey	Patients	No clinically significant difference was found between solo and group
2013		Physicians	practices in the management of chronic diseases by $G_{\underline{P}}^{\underline{\beta}}$ .
Wiley et al.,	Survey	Patients	Processes for the patient-centered medical home mode have increased in all
2015		Physicians	group practices sizes over time but are only present in $\frac{1}{2}$ ss than half of even
			large groups. Additionally, a reduction in patient involvement in care was
			noted over time.
Fryer et al.,	Survey	Patients	The Patient Perceptions of Integrated Care survey identified a decrease in
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			BMJ Open	
			BMJ Open BMJ Open 202	
2017			utilization of emergency department and outpatient resources amongst patier	it
			with multiple chronic illnesses who perceived a higher	l
			the group practice that delivered care to them. $\int_{\alpha}^{\infty}$	
Baker et al.,	Survey	Patients	No significant changes reported in quality measures based on group practice	
2018		Physicians	size.	
Bardos et al.,	Cohort	Patients	Compared to those in groups, solo obstetricians had a bigher Cesarean section	n
2018		Physicians	rates but lower rates of shoulder dystocia and third or $\frac{a}{2}$ but he degree tears	
			which was felt to indicate that they had a more conservative approach to	
			labour.	
Cohidon et	Survey	Patients	Patients in family physician group practices in Switzer and reported a better	
al., 2018		Physicians	experience with continuity and co-ordination of care compared to solo	
			practices. No differences were seen in their experiences with access and	
			communication between the practice types.	
Ellis et al.,	Systematic	Patients	In a limited number of studies, patients appeared to begin ore satisfied with	
2018	review	Physicians	specialist group practices rather than solo practices with respect to tangibles	
			and their own assessment of quality.	
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			BMJ Open 60
			BMJ Open 136/bmjopen-202
Freemyer &	Case Report	Patients	In a group practice, there may be differing opinions and risk tolerance amon
Stoff, 2018		Physicians	members especially with non-adherent patients and portentially dangerous
			medications. In order to minimize the effect on contingity of care, physician
		~	in group practices should develop policies around chargenging situations and
		Ko.	apply these consistently to patients.
Hollenbeck et	Cohort	Patients	Prostate cancer patients were found to be more likely to eated with intensity-
al., 2018		Physicians	modulated radiation therapy if the urology group own $e_{g}^{\overline{\underline{a}}}$ radiation facilities
			regardless of group size even if the treatment was unlisely to be beneficial,
			suggesting that the financial incentive outweighed best practices in prostate
			cancer care and that group practices do not prevent conflicts of interest.
Stol et al.,	Survey	Physicians	Practices that implemented selective prevention for cardiometabolic disease
2018			were more often group practices rather than solo practices. These practices
			were also organized better for chronic disease management. $\vec{3}$
Xierali, 2018	Cross-	Physicians	Physicians in group practices were more likely to practice at multiple sites
	sectional		which may increase the access to care for patients.
	study		which may increase the access to care for patients.
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# Table 2 – Papers Assessing Physician Outcomes

			BMJ Open BMJ Open
Table 2 Dam	A DI		BMJ Open 36/bmjopen-2020-04157
Table 2 – Pape	ers Assessing Ph	ysician Outcomes	-04 157
Author	Study Design	Population Studied	Key Findings 9 ∞
Bailey, 1968	Cohort	Patients	Physicians, rather than patients, benefit the most from multidisciplinary grou
		Physicians	practices as their output was lower, fees were higher, $add$ they ordered more
		0	tests especially if that service was offered by the group
Rose, 1968	Letter	Physicians	Income deferral by physicians until later in life when they were less
			productive was viewed as a benefit of group practices.
Terris, 1968	Letter	Physicians	Group practices were mostly limited to hospitals with most other physicians
			working in solo practices outside of the hospitals, and was believed that
			group practices would not be taken up unless it was established as a desirabl
			form of practice to society and health care professionals.
Weinerman,	Letter	Patients	Group practices needed to be refocused on patients in erder to be relevant to
1968		Physicians	societal needs.
Verbeek-	Survey	Physicians	A significant desire for contacts and co-operation with other general
Heida, 1969			practitioners led to improved attitudes about group pragtices in the
			Netherlands.
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			BMJ Open
			BMJ Open 136/bmjopen-202
Mahoney,	Survey	Physicians	Future surgeons preferred solo practice due to the potential loss of autonor
1973			while future obstetricians and pediatricians preferred performed p
			and future internists preferred group practices. $\int_{\frac{1}{2}}^{\infty}$
Wallace,	Letter	Physicians	This letter from the secretary-general of the Canadian Medical Association
1974			highlighted the possible need for government support $\bigcup_{i=1}^{N}$ help with the
			establishment of medical groups.
Evashwick,	Cross-	Physicians	Non-metropolitan areas in the United States that have greater percentage
1976	sectional		group practices have better retention and recruitment rates.
	Study		Domjope Domjope
Kimbell &	Survey	Physicians	In 1979 in the United States, physician annual gross regenue, total patient
Lorant, 1977			visits per year, and office visits per year were measured and there were $\Box$
			increasing returns to scale for physicians in solo or small group practice ar
			inefficiencies noted in large group practices.
Paulick &	Survey	Physicians	In Canada, 57% of graduating physicians entered a group practice or
Roos, 1978			partnership, 21% entered solo practice, and 22% became salaried physician
			Surgeons and psychiatrists were most likely to enter solo practice.
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			BMJ Open 30
			BMJ Open 136/bmjopen-202
Davies, 1979	Survey	Physicians	In 1978 in New Zealand, group practices had higher cost than solo practices.
Graham,	Survey	Physicians	The Manpower Survey of Oral Surgery was performed and it was reported
1979			that oral surgeons working in group practices had high $\overset{\infty}{\overset{\infty}{\overset{\infty}{\overset{\infty}{\overset{\infty}{\overset{\infty}{\overset{\infty}{\overset{\infty}$
			employed fewer full-time equivalent staff per surgeon
Pasternak et	Survey	Physicians	There was no significant difference in physician satisfication between those
al., 1986			practicing in groups vs those in solo practice in the southwest United States.
McCormick	Survey	Physicians	GPs in solo practice earn less than those in group practices (gross income
& Thomson,			19% less) due to lower fees and lower numbers of patients seen.
1989			
Holden, 1990	Letter	Physicians	Solo family physician practice in rural areas was in degline and unlikely to
			succeed as group practices were forming and offering getter benefits to
			graduating residents.
Williams et	Survey	Physicians	Half of the physicians were in either solo or group pragices and the other ha
al., 1990			had some group practice arrangements for financial benefits. They
			hypothesized that future formation of group practices would require some
			incentives from government, which has happened.
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			BMJ Open
			BMJ Open 60 bmjopen 202
Schryver et	Case Report	Physicians	A unique group practice without walls structure is deservibed which allows
al., 1993			the formation of a group with physicians at different $\log_{\Theta}$
			enjoy the business and professional benefits of a group practice, but this st
			allows for autonomy, decentralization, and individual bractice style.
Hays &	Interviews	Physicians	GPs in Australia who were interested in forming group practices were
Sanderson,			completed and identified incompatible personalities or $\underline{\underline{S}}_{\underline{\alpha}}$
1994			and real estate issues, and initial costs as barriers. $\frac{a}{1}$
Connor et al.,	Survey	Physicians	Group practice opportunities are an important aspect in recruiting physicia
1995		Healthcare Systems	to practice in a rural hospital in order to reduce isolation, pool resources, a
			decrease call burden.
Stamps, 1995	Survey	Physicians	Physicians in private group practices were significantly more satisfied wit
			personal and lifestyle factors than those in solo, hospit $\mathbf{\underline{\underline{n}}}^{\mathbf{\underline{5}}}$ , or health
			maintenance organization related practices.
Defelice &	Survey	Physicians	Data from the Physicians' Practice Cost and Income Survey found no
Bradford,			significant differences in practice efficiency between solo and group prima
1997			care practices in the United States.
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			BMJ Open
			BMJ Open BMJ Open 202
Hueston,	Survey	Physicians	GPs associated with solo or small group ( $\leq 3$ physicians) practices were foun
1998			to be less satisfied.
Dowell et al.,	Survey	Physicians	$\overset{\mathbf{\alpha}}{GPs}$ associated with solo practices were found to be less satisfied than those
2000			in group practices.
Bland et al.,	Cohort	Patients	Income pooling within an obstetrical call group in a Canadian study led to
2001		Physicians	decreased rates of elective induction of labour in a before and after study.
Romano,	Letter	Physicians	Group practices generally enhanced United States physicians' quality of life
2001			improved patient care, improved professional develop
			earnings.
Sturm, 2002a	Survey	Physicians	Data from the Community Tracking Study was used to show that surgeons
			working within a small practice was the greatest predictor of career
			dissatisfaction and that patient quality of care was imp $\underline{\underline{\underline{B}}}_{\underline{\underline{A}}}$ cted by income
			pressures as well as decreased continuity of care and clinical freedom within
			solo or 2 surgeon practices.
Sturm, 2002b	Survey	Physicians	Data from the Community Tracking Study found that physicians working
			within a solo or 2 physician practice was the greatest $p_{\text{redictor}}^{\overline{Q}}$
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			BMJ Open
			BMJ Open 36/bmjopen-20
			dissatisfaction. They also reported less clinical freedore and constraints of
			income.
Casalino et	Survey	Physicians	Data from the Community Tracking Study was also used to find that the
al., 2003		Healthcare systems	frequently cited reason for group practice formation was negotiating leve
			and barriers included lack of leadership, physician co-operation, and
		<sup>r</sup> b.	investment.
Crane &	Case Report	Physicians	The growth and subsequent deterioration of a large orthopedic group pra
Dennis, 2003		Healthcare systems	which amalgamated multiple smaller groups is described. The eventual
			demise of the practice appeared to be due to poor leadership, disagreeme
			over re-imbursement, differing visions for the future of the group, dissat
			office staff who were in danger of being let go due to entralization, diff
			in negotiations with payers, and being undercut by smaller competing gr
Curoe et al.,	Survey	Physicians	Physicians in the United States found that as group practice size increase
2003			culture is less collegial, less cohesive, and there is less organizational tru
			which was also true for multi-specialty practices compared to single
			specialty.
			by copyright.
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			BMJ Open Physicians working in solo practices viewed improved quality of life,
			pen-202
Feron et al.,	Survey	Physicians	Physicians working in solo practices viewed improved quality of life,
2003			knowledge sharing, and continuity of care as motivation to form a group
			practice. Interpersonal relationships, budget issues, $\log_{\Theta}^{\infty}$ of the patient-
		$\sim$	physician relationship, and differing views of the group were viewed as $\mathbf{S}$
			barriers.
Casalino et	Survey	Physicians	Data from the Community Tracking Study was used to assess the reasons for
al., 2004		Healthcare systems	growth of group practices and it was seen that physicians were increasingly
			forming single specialty group practices to not only increase the scope of
			surgical services and diagnostic imaging they could offer, but also gain
			negotiating leverage with payers.
Lin et al.,	Survey	Physicians	In Taiwan, higher incomes were realized by physician who were in single o
2006			multi-specialty groups when compared to solo practice physicians. $\exists$
Solberg et al.,	Survey	Physicians	Within a family medicine group in the United States, oategories important to
2006			a high level of care included teamwork, leadership, patient centered care,
			quality improvement, accountability, and a sense of ownership. $\exists$
Liebhaber &	Letter	Physicians	From 1996/97 to 2004/05, the proportion of physician gin solo or 2 physician
			ру сор
			by copyright

			BMJ Open
			BMJ Open practices decreased from 40.7% to 32.5% and physicians were increasingly
Grossman,			practices decreased from 40.7% to 32.5% and physicians were increasingly
2007			forming single specialty rather than multi-specialty group practices. $\beta$
Lowes, 2007	Survey	Physicians	Primary care physicians in the United States were earning more money if
			they practiced within groups of more than 50 physicians.
Rivet et al.,	Survey	Physicians	Family physicians in solo practice had greater overall job satisfaction in thi
2007			survey that primarily assessed improved satisfaction $a_{\underline{\alpha}}^{\underline{S}}$
			performing procedures.
Zazzali,	Survey	Physicians	Stronger group culture emphasizing participation, tean work, and
Alexander,			cohesiveness promoted physician satisfaction. Conversely, a hierarchical
Shortell, &			structure had a negative effect on satisfaction.
Burns, 2007			structure had a negative effect on satisfaction.
Masselink,	Survey	Physicians	Data from the Physician Worklife Survey found that geod relationships wit
Lee, &			colleagues in a large group practice led to a decrease in a physician's intent
Konrad, 2008			withdrawal from practice. A similar effect was not seen for physicians in small or solo practices.
			small or solo practices.
Breon, 2009	Case Report	Physicians	After the establishment of a surgical group practice in gural Iowa by five
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			BMJ Open
			BMJ Open 60 bmjopen-202
		Healthcare Systems	surgeons the access to surgical care at multiple hospitals improved and sha
			call coverage was achieved.
Rodríguez &	Case Study	Physicians	A family medicine group in Quebec was assessed during its formation and $\exists g$
Pozzebon,		Allied health	difficulties with interpersonal and interprofessional relationships were
2010		Healthcare systems	identified and found to be quite detrimental to the functioning of the team. $\hat{\xi}$
		6	new director was able to mend these relationships, improve communication
		Ne	and move the group forward.
Streu et al.,	Survey	Physicians	Working within a group practice led to increased job satisfaction for plastic
2010			surgeons as they were less professionally isolated.
Koppula et	Interviews	Physicians	Group practices allowed family physicians to have a better work-life baland
al., 2011			collaboration, and support from fellow group members and allowed for $\underline{g}$
			continuity of care during and beyond the obstetrical $ev \underline{\underline{A}}_{n}$ ints. Some challenge
			identified included sustainability (securing locum physicians to cover
			absences) and conflict within the group.
Rao et al.,	Survey	Physicians	Family physicians in the United States in solo practices were found to be le
2011			likely to adopt electronic health records when compared to those in group
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			BMJ Open
			BMJ Open 136/bmjopen-202
			practices.
Suchman A	Abstract	Physicians	Chronic conflict, behavioural accountability, and a congroup vision were
et al., 2011			addressed in a small group practice through regular $m_{\underline{s}}^{\underline{\omega}}$ tings, retreats, and
		$\sim$	objective assessment by allied health professionals to $\frac{1}{100}$
			function.
Orton et al.,	Survey	Physicians	Higher rates of depersonalization were identified in $GE$ in the UK workin
2012			in group practices vs solo practices which was felt to $b_{\underline{g}}^{\underline{a}}$ due to poor
			interpersonal relationships as well as increased demands and less autonom
Burns et al.,	Review	Physicians	Currently, part of the reason larger groups in the United States may be
2013			forming is because they are able to leverage insurers not effectively and
			build up more market share. Groups with over 100 physicians are increasing
Damiani et	Systematic	Patients	Greater uptake of health information technology in GRegroup practices
al., 2013	Review	Physicians	compared to solo practices and a higher satisfaction with compensation was
		Healthcare Systems	noted.
Mosaly et al.,	Abstract	Physicians	Physicians who cross-cover patients may perceive that their workloads are
2013			increased, and performance decreased.
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Streu et al.,     Survey     Physicians     Working in a group practice was identified as a practice characteristic				BMJ Open 36 BMJ Open 37
2013sectional Studyincrease in number, with a decrease in the number of studyXierali et al., 2013SurveyPhysiciansFamily physicians in solo or small practices were less 				open-200
StudyStudyXierali et al., 2013SurveyPhysiciansFamily physicians in solo or small practices were less the electronic health records compared to those in larger group practices.Heimeshoff et al., 2014SurveyPhysiciansTechnical efficiencies were higher for group practices but this was also associated with higher costs compared to solo practices groups in California between 2009 and 2012.Robinson & Miller, 2014Cross- sectional StudyPhysiciansHospital owned physician groups had higher costs that physician owned groups in California between 2009 and 2012.Schulte et al., 2014SurveyPhysiciansFamily physicians were less likely to pass the American Board of Family Medicine maintenance of certificate exam if they were in a solo practice which was thought to result from the ability to spend more time on quality improvement and education within a group practice (GR 0.48 [95%CI 0.34 0.68]).Streu et al., Streu et al.,SurveyPhysiciansWorking in a group practice was identified as a practice characteristic	Welch et al.,	Cross-	Physicians	Between 2009 and 2011, groups of greater than 100 physicians continued to
Xierali et al., 2013SurveyPhysiciansFamily physicians in solo or small practices were less the electronic health records compared to those in larger group practices.Heimeshoff et al., 2014SurveyPhysiciansTechnical efficiencies were higher for group practices out this was also associated with higher costs compared to solo practices groups in California between 2009 and 2012.Robinson & Miller, 2014Cross- sectional StudyPhysiciansHospital owned physician groups had higher costs that physician owned groups in California between 2009 and 2012.Schulte et al., 2014SurveyPhysiciansFamily physicians were less likely to pass the American Board of Family Medicine maintenance of certificate exam if they were in a solo practice which was thought to result from the ability to spend more time on quality improvement and education within a group practice (OFR 0.48 [95%CI 0.34 0.68]).Streu et al., Streu et al.,SurveyPhysiciansWorking in a group practice was identified as a practice characteristic	2013	sectional		increase in number, with a decrease in the number of $s \vec{9}$ lo practitioners.
2013electronic health records compared to those in larger group practices.HeimeshoffSurveyPhysiciansTechnical efficiencies were higher for group practices but this was also associated with higher costs compared to solo practicesRobinson & Miller, 2014Cross- sectional StudyPhysiciansHospital owned physician groups had higher costs that physician owned groups in California between 2009 and 2012.Schulte et al., 2014SurveyPhysiciansFamily physicians were less likely to pass the American Board of Family Medicine maintenance of certificate exam if they werein a solo practice which was thought to result from the ability to spend nore time on quality improvement and education within a group practice (Opp 0.48 [95%CI 0.34 - 0.68]).Streu et al., SurveySurveyPhysiciansWorking in a group practice was identified as a practige characteristic		Study		- Contraction of the second seco
Heimeshoff et al., 2014SurveyPhysiciansTechnical efficiencies were higher for group practices but this was also associated with higher costs compared to solo practicesRobinson & Miller, 2014Cross- sectional StudyPhysiciansHospital owned physician groups had higher costs that physician owned groups in California between 2009 and 2012.Schulte et al., 2014SurveyPhysiciansFamily physicians were less likely to pass the American Board of Family Medicine maintenance of certificate exam if they were a solo practice which was thought to result from the ability to spend nor en quality improvement and education within a group practice (Opp 0.48 [95%CI 0.34 0.68]).Streu et al., Streu et al.,SurveyPhysiciansWorking in a group practice was identified as a practice characteristic	Xierali et al.,	Survey	Physicians	Family physicians in solo or small practices were less kely to adopt
et al., 2014       associated with higher costs compared to solo practice         Robinson &       Cross-       Physicians       Hospital owned physician groups had higher costs that physician owned         Miller, 2014       sectional       groups in California between 2009 and 2012.       Image: Compared to solo practice         Schulte et al.,       Survey       Physicians       Family physicians were less likely to pass the American Board of Family         2014       Medicine maintenance of certificate exam if they were in a solo practice       more time on quality         2014       Medicine maintenance of certificate exam if they more in a solo practice       Medicine maintenance of certificate exam if they more in a solo practice         Streu et al.,       Survey       Physicians       Working in a group practice was identified as a practice         Streu et al.,       Survey       Physicians       Working in a group practice was identified as a practice	2013		$\sim$	electronic health records compared to those in larger $g_{g}^{\aleph}$ practices.
Robinson & Miller, 2014Cross- sectional StudyPhysiciansHospital owned physician groups had higher costs that physician owned groups in California between 2009 and 2012.Schulte et al., 2014SurveyPhysiciansFamily physicians were less likely to pass the American Board of Family Medicine maintenance of certificate exam if they werein a solo practice which was thought to result from the ability to spend more time on quality improvement and education within a group practice (OFR 0.48 [95%CI 0.34 - 0.68]).Streu et al.,SurveyPhysiciansWorking in a group practice was identified as a practice characteristic	Heimeshoff	Survey	Physicians	Technical efficiencies were higher for group practices but this was also
Miller, 2014       sectional       groups in California between 2009 and 2012.         Schulte et al.,       Survey       Physicians       Family physicians were less likely to pass the American Board of Family         2014       Medicine maintenance of certificate exam if they werein a solo practice which was thought to result from the ability to spend more time on quality improvement and education within a group practice (OFR 0.48 [95%CI 0.34 0.68]).         Streu et al.,       Survey       Physicians         Working in a group practice was identified as a practice characteristic	et al., 2014			associated with higher costs compared to solo practices
StudyStudySchulte et al., 2014SurveyPhysiciansFamily physicians were less likely to pass the American Board of Family Medicine maintenance of certificate exam if they were in a solo practice which was thought to result from the ability to spend more time on quality improvement and education within a group practice (OR 0.48 [95%CI 0.34 0.68]).Streu et al.,SurveyPhysiciansWorking in a group practice was identified as a practice characteristic	Robinson &	Cross-	Physicians	Hospital owned physician groups had higher costs that physician owned
StudyStudyPhysiciansFamily physicians were less likely to pass the American Board of Family Medicine maintenance of certificate exam if they were in a solo practice which was thought to result from the ability to spend nor time on quality improvement and education within a group practice (OR 0.48 [95% CI 0.34 0.68]).Streu et al.,SurveyPhysiciansWorking in a group practice was identified as a practice characteristic	Miller, 2014	sectional		groups in California between 2009 and 2012.
2014       Medicine maintenance of certificate exam if they were in a solo practice which was thought to result from the ability to spend more time on quality improvement and education within a group practice (OR 0.48 [95%CI 0.34 0.68]).         Streu et al.,       Survey       Physicians       Working in a group practice was identified as a practice characteristic		Study		n.bmj.c
which was thought to result from the ability to spend nore time on quality         improvement and education within a group practice (OR 0.48 [95%CI 0.34 - 0.68]).         Streu et al.,       Survey         Physicians       Working in a group practice was identified as a practice characteristic	Schulte et al.,	Survey	Physicians	Family physicians were less likely to pass the American Board of Family
Streu et al.,       Survey       Physicians       Working in a group practice was identified as a practice characteristic	2014			Medicine maintenance of certificate exam if they were in a solo practice
Streu et al.,     Survey     Physicians     Working in a group practice was identified as a practice characteristic				which was thought to result from the ability to spend $n_{N}^{\overline{N}}$ time on quality
<u><u><u>α</u></u></u>				improvement and education within a group practice ( $\stackrel{\bullet}{OR}$ 0.48 [95% CI 0.34 -
<u><u>a</u></u>				0.68]).
бу бу 	Streu et al.,	Survey	Physicians	Working in a group practice was identified as a practice characteristic
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			BMJ Open
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2014			associated with professional burnout in plastic surgeons and comments from
			the survey seemed to indicate that this was due to poor $\vec{a}$ interpersonal
			relationships within groups.
Valentine et	Survey	Physicians	Surgeons working in solo practice were less likely to pass their maintenan
al., 2014			of certification examination compared to those in group practices (OR 0.2
			[95% CI 0.06-0.77]).
Kralewski et	Survey	Physicians	Group practices that focus on improved screening and monitoring may
al., 2015			improve avoidable utilization, cost, and revenue.
Moosa et al.,	Survey	Physicians	GPs working in groups were more optimistic about the future compared to
2016			solo practitioners and worked fewer days but saw more patients per day.
Muhlestein &	Cross-	Physicians	Between 2013 and 2015, the largest changes in group practice size were a
Smith, 2016	sectional		decrease in small groups and an increase in very large $\mathbf{x}_{\mathbf{x}}$ roups of over 100
	Study		physicians. Groups of 100 or more increased from $29.\overline{6\%}$ to 35.1%. Group
			with 1-2 physicians decreased from 22.5% to 19.8%. $\frac{14}{22}$
Fryer et al.,	Survey	Patients	Improved utilization of emergency department and outpatient resources
2017			amongst patients with chronic illnesses in group practices who perceive a
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			BMJ Open
			BMJ Open     36       higher level of integration.     04
			higher level of integration.
Gisler,	Survey	Physicians	Young GPs in Switzerland prefer to work part-time in group practices of up
Bachofner,			to 5 physicians.
Moser-			uary 2
Bucher,		K.	021. D
Scherz, &		Or Dr	ownloa
Streit, 2017			to 5 physicians.
Kwietniewski	Survey	Physicians	Costs of group practices were higher than those of sole practices due to more
et al., 2017			investment in technological costs that solo practices would not be able to
			afford.
Mazurenko et	Survey	Physicians	Solo physicians had less health information technology and had less email
al., 2017			correspondence with patients and other physicians. $\frac{1}{2}$
Viehmann et	Survey	Physicians	Chronic stress was identified in 26.3% of German GP sand practice assistants
al., 2017			with no difference observed between those in solo and group practices.
Baker et al.,	Survey	Patients	The use of HIT, care management processes, and quality improvement
2018		Physicians	processes increased over time, but only quality improvement processes were
			by copyright.

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Page 61 of 62				BMJ Open	136/bm
1 2				BMJ Open attributable to a larger group size. Additionally, no sig	njopen-20
3 4				attributable to a larger group size. Additionally, no sig	Bificant differences
5 6 7				were seen in cost and quality between different group	15
8 9	Kwietniewski	Survey	Physicians	Group practices of all sizes and most specialties have	$\frac{\infty}{2}$
10 11	& Schreyögg,		$\sim$	more technical, cost, and profit efficiencies than solo	ត្ត mactices and this was
12 13 14	2018			thought to be due to the standardization of processes.	21. Dow
15	Noroxe et al.,	Survey	Physicians	More than half of Danish GPs reported at least one bu	Boout symptom. Those
16 17 18	2018			in group practices were less likely to report a poor wo	ek-life balance
19 20				compared to solo GPs.	http:/
22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44					njopen.bmj.com/ on April 17, 2024 by guest. Protected by copyright.
45 46			For peer review only ·	- http://bmjopen.bmj.com/site/about/guidelines.xhtml	

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Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) Checklist

SECTION		PRISMA-ScR CHECKLIST ITEM	REPORTED
TITLE			
Title	1	Identify the report as a scoping review.	1
ABSTRACT Structured summary 2		Provide a structured summary that includes (as applicable): background, objectives, eligibility criteria, sources of evidence, charting methods, results, and conclusions that relate to the review questions and objectives.	2
INTRODUCTION		00,000,000.	1
Rationale	3	Describe the rationale for the review in the context of what is already known. Explain why the review questions/objectives lend themselves to a scoping review approach.	4-5
Objectives	4	Provide an explicit statement of the questions and objectives being addressed with reference to their key elements (e.g., population or participants, concepts, and context) or other relevant key elements used to conceptualize the review questions and/or objectives.	5
METHODS			
Protocol and registration	5	Indicate whether a review protocol exists; state if and where it can be accessed (e.g., a Web address); and if available, provide registration information, including the registration number.	6
Eligibility criteria	6	Specify characteristics of the sources of evidence used as eligibility criteria (e.g., years considered, language, and publication status), and provide a rationale.	6
Information sources*	7	Describe all information sources in the search (e.g., databases with dates of coverage and contact with authors to identify additional sources), as well as the date the most recent search was executed.	6
Search	8	Present the full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	Supp App B
Selection of sources of evidence†	9	State the process for selecting sources of evidence (i.e., screening and eligibility) included in the scoping review.	6-7
Data charting process‡	10	Describe the methods of charting data from the included sources of evidence (e.g., calibrated forms or forms that have been tested by the team before their use, and whether data charting was done independently or in duplicate) and any processes for obtaining and confirming data from investigators.	7
Data items	11	List and define all variables for which data were sought and any assumptions and simplifications made.	7
Critical appraisal of individual sources of evidence§	12	If done, provide a rationale for conducting a critical appraisal of included sources of evidence; describe the methods used and how this information was used in any data synthesis (if appropriate).	N/A
Synthesis of results	13	Describe the methods of handling and summarizing the data that were charted.	7



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SECTION	ITEM	PRISMA-ScR CHECKLIST ITEM	REPORTED
RESULTS			
Selection of sources of 14 evidence		Give numbers of sources of evidence screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally using a flow diagram.	8 Figure 1
Characteristics of sources of evidence	15	For each source of evidence, present characteristics for which data were charted and provide the citations.	8 Supp App A
Critical appraisal within sources of evidence	16	If done, present data on critical appraisal of included sources of evidence (see item 12).	N/A
Results of individual sources of evidence	17	For each included source of evidence, present the relevant data that were charted that relate to the review questions and objectives.	8-14 Supp App A
Synthesis of results	18	Summarize and/or present the charting results as they relate to the review questions and objectives.	8-14
DISCUSSION			
Summary of evidence	19	Summarize the main results (including an overview of concepts, themes, and types of evidence available), link to the review questions and objectives, and consider the relevance to key groups.	15-17
Limitations	20	Discuss the limitations of the scoping review process.	18
Conclusions	21	Provide a general interpretation of the results with respect to the review questions and objectives, as well as potential implications and/or next steps.	18-19
FUNDING			
Funding	22	Describe sources of funding for the included sources of evidence, as well as sources of funding for the scoping review. Describe the role of the funders of the scoping review.	19

JBI = Joanna Briggs Institute; PRISMA-ScR = Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews.

\* Where *sources of evidence* (see second footnote) are compiled from, such as bibliographic databases, social media platforms, and Web sites.

† A more inclusive/heterogeneous term used to account for the different types of evidence or data sources (e.g., quantitative and/or qualitative research, expert opinion, and policy documents) that may be eligible in a scoping review as opposed to only studies. This is not to be confused with *information sources* (see first footnote).

<sup>‡</sup> The frameworks by Arksey and O'Malley (6) and Levac and colleagues (7) and the JBI guidance (4, 5) refer to the process of data extraction in a scoping review as data charting.

§ The process of systematically examining research evidence to assess its validity, results, and relevance before using it to inform a decision. This term is used for items 12 and 19 instead of "risk of bias" (which is more applicable to systematic reviews of interventions) to include and acknowledge the various sources of evidence that may be used in a scoping review (e.g., quantitative and/or qualitative research, expert opinion, and policy document).

From: Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMAScR): Checklist and Explanation. Ann Intern Med. 2018;169:467–473. doi: 10.7326/M18-0850.

