

Accepted Manuscript

British Journal of General Practice

Which patients miss appointments with general practice and why? A systematic review

Parsons, Jo; Bryce, Carol; Atherton, Helen

DOI: <https://doi.org/10.3399/BJGP.2020.1017>

To access the most recent version of this article, please click the DOI URL in the line above.

Received 12 November 2020

Revised 01 February 2021

Accepted 03 February 2021

© 2021 The Author(s). This is an Open Access article distributed under the terms of the Creative Commons Attribution 4.0 License (<http://creativecommons.org/licenses/by/4.0/>). Published by British Journal of General Practice. For editorial process and policies, see:
<https://bjgp.org/authors/bjgp-editorial-process-and-policies>

When citing this article please include the DOI provided above.

Author Accepted Manuscript

This is an 'author accepted manuscript': a manuscript that has been accepted for publication in British Journal of General Practice, but which has not yet undergone subediting, typesetting, or correction. Errors discovered and corrected during this process may materially alter the content of this manuscript, and the latest published version (the Version of Record) should be used in preference to any preceding versions

Which patients miss appointments with general practice and why? A systematic review

Dr Joanne Parsons, Research Fellow. Warwick Medical School, University of Warwick, Gibbet Hill, Coventry, CV4 7AL. BSc (hons), MSc, MSc, PhD. Jo.Parsons@warwick.ac.uk

Dr Carol Bryce, Research Fellow. Warwick Medical School, University of Warwick, Gibbet Hill, Coventry, CV4 7AL. MA (hons), MA, PhD.

Dr Helen Atherton, Associate Professor. Warwick Medical School, University of Warwick, Gibbet Hill, Coventry, CV4 7AL. BSC (hons), MSc, MPH, PhD.

Which patients miss appointments with general practice and why? A systematic review

Background

Missed GP appointments have considerable time and cost implications for healthcare services.

Aim

This systematic review aims to explore the rate of missed primary care appointments, what the reported reasons are for appointments being missed, and which patients are more likely to miss appointments.

Design

This study reports the findings of a systematic review

Setting

Included studies report the rate or reasons of missed appointments in a primary care setting.

Method

Databases were searched using a pre-defined search strategy. Eligible studies were selected for inclusion based on detailed inclusion criteria through title, abstract and full text screening. Quality was assessed on all included studies, and findings were synthesised to answer the research questions.

Results

A total of 26 studies met the inclusion criteria for inclusion in the review. Of these, 19 reported a rate of missed appointments, with a mean rate of 15.2% and a median of 12.9% appointments being missed. Twelve studies reported a reason appointments were missed, with work or family commitments, forgetting the appointment and transportation difficulties most commonly reported. 20 studies reported characteristics of people likely to miss appointments. Patients who were likely to miss appointments were those from minority ethnicity, low socio-demographic status and younger patients.

Conclusions

Findings from this review have potential implications for targeted interventions to address missed appointments in primary care. This is the first step for clinicians being able to target interventions to reduce the rate of missed appointments.

Keywords

General Practice, Missed appointments, Primary Care, Did not attend.

How this fits in

Missed GP appointments have considerable time and cost implications on healthcare services. This review reveals how many booked primary care appointments are missed, reasons given for this, and what characteristics are commonly associated with missed appointments. This has implications for general practices and clinicians aiming to reduce rates of missed appointments, and implementing strategies for this.

Introduction

Missed GP appointments have substantial time and cost implications for the NHS. Recent estimations suggest more than 15 million appointments are missed annually in England¹. Approximately 7.2 million of these are missed appointments with GPs, costing NHS England £216 million per year.¹ The high volume of missed appointments exacerbate the increasing demand on GPs and primary care, by taking up and not utilising valuable appointment slots, at a time where patients are presenting with more complex and comorbid conditions.² Understanding why patients miss appointments, and how to best manage this is therefore an important research concern.

Whilst patients may feel that missed appointments are frustrating for GPs and receptionists find them annoying, GPs have less negative views, often considering them time to catch up.³ It is clear,

however, that missed appointments can lead to unresolved medical problems, leaving patients vulnerable and presenting later or living with untreated or worsening health.⁴ Previous research shows that patients with multi-morbidity,⁵ living in high deprivation areas,^{6,7} with mental health problems⁶ or being young adults⁷ are more likely to miss GP appointments. Research looking at why appointments are missed, found the most common reasons to be; forgetting appointments, difficulty cancelling appointments, inconvenient appointment time, being too ill to attend or no longer needing appointments due to resolved health issues.^{8,9}

A systematic review of missed GP appointments was published in 2003,⁹ since when much has changed in the way that general practice appointments have been delivered and planned in particular during the COVID-19 pandemic making a review timely. Interventions and policies to reduce missed appointments have been introduced¹⁰ with changes including online triage and booking,¹¹ telephone consultations¹² and SMS appointment reminders^{13,14}.

This review aims to provide valuable insight to those commissioning and delivering GP services, by examining which patients miss booked appointments at general practice and to examine why this happens.

Method

This systematic review was conducted in accordance with the protocol (CRD42019139819) published on the International Prospective Register of Systematic Reviews (PROSPERO)

<http://www.crd.york.ac.uk/PROSPERO/>

PRISMA guidelines¹⁵ were followed.

Inclusion and exclusion criteria

The inclusion criteria for the review were: any study design, studies that examined missed booked routine appointments with staff at general practice (or the equivalent in non-UK studies), that included statistical information about rate of missed booked appointments, reasons appointments are missed, or both, published in English 2003 onwards (since a previous review)⁹.

Search Strategy

MEDLINE, Embase, Web of Science, Scopus, Cochrane Library database, PsycINFO and Cochrane Central Register of Controlled Trials (CENTRAL) were searched. Reference lists of all included studies were also searched. Searches included all terms relevant for the intervention being examined. (Example full search strategy used can be found in Supplementary Box 1).

Searches included records from May 2003 (when the previous review of this topic was published) and were run in September 2019. No language restrictions were placed on the searches.

Screening and selection of studies

After duplicates were removed, titles and abstracts of remaining results were independently screened by two authors against the inclusion criteria. Discrepancies were resolved by a third author. Full texts were retrieved for all studies meeting inclusion criteria at title and abstract stage, and were then subjected to full text screening. Studies that met the inclusion criteria at full text stage were included in the review. Discrepancies with full text inclusion were resolved by a third author.

Extraction

Data were extracted using a specifically designed form, by two authors independently, and any discrepancies were discussed and resolved by a third author if necessary. Setting, participants, the

rate of missed appointments, reasons given for missing appointments and characteristics of participants missing appointments were extracted from each study.

Quality assessment

The Mixed Methods Appraisal Tool (MMAT) version 2018¹⁶ was used to assess quality of included studies. An overall quality rating was determined, for contextual information only, based on the number of positive or negative scores each study was rated. This tool is appropriate for use where studies use a range of methodologies as is the case for this review. Each study was assessed using five assessment points, and then an overall rating system was applied to each study.¹⁷ Studies were given an overall rating of high quality if four or five criteria were met, moderate quality if three criteria were met, and low quality if two or less criteria were met¹⁷.

Data analysis

Rates of missed appointments (percentage of appointments missed, mean and median) were extracted where reported, and where other data on numbers of missed appointments were included we calculated a rate. Included studies which reported reasons for missed appointments or characteristics of patients missing appointments were analysed thematically by two authors, classifying results, from which themes were derived. Using a narrative synthesis, we looked at themes across the data. Narrative synthesis enables studies with different designs to be analysed in a systematic way considering the similarities and differences between the studies¹⁸.

Results

A total of 4,906 results were screened, resulting in the inclusion of 26 studies in the review. Screening process and numbers and reasons for exclusions can be found in the PRISMA flowchart in Supplementary Figure 1.¹⁵

Main characteristics of included studies can be found in Table 1 and Supplementary Table 1. Of the 26 included studies, 19^{19,20,23,24,25,27,28,29,30,31,32,33,34,35,36,37,38,39,40} reported a rate of missed appointments and two^{5,10} reported a rate of number of patients that missed appointments. Twelve studies^{3,8,19,21,22,23,24,25,26,27,28,29} reported reasons that patients miss appointments. Of these, three^{3,21,26} reported health care professionals' opinions on why patients miss appointments, and the remaining nine^{8,19,22,23,24,25,27,28,29} presented patient reported reasons for missing appointments. Twenty studies^{5,8,10,19,21,23,24,25,26,27,28,29,30,31,32,33,34,35,36,40} described characteristics of patients that missed appointments.

Table 1 here

Quality assessment

Twenty five^{3,5,8,10,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40} of the included studies were rated as high quality, whilst one was rated as moderate quality overall.¹⁹ All studies stated a clear research question, and appropriate study design. The most frequent unmet criterion was 'Are confounders accounted for in the design and analysis' in quantitative non-randomised studies, with four out of five^{8,23,32,40} failing to satisfy this. Quality assessment ratings for each included study can be found in Supplementary Table 2.

Rate of missed appointments

Of 26 included studies, 19^{19,20,23,24,25,27,28,29,30,31,32,33,34,35,36,37,38,39,40} reported a rate of missed appointments. Overall rate of missed appointments were between 3.3-48.1%, with an overall mean of 15.2% and median of 12.9%. Rates of missed appointments were grouped by country of study. The rate of missed appointments were similar between countries (Table 2). One study from

Malaysia²⁰ had a particularly high rate of missed appointments 48.1%. This study looked at a clinic which operated a walk-in system for standard care and booked appointments for follow up care. The missed appointment rate was for the booked follow up appointments.

Table 2 here

Rates of missed appointments were collated by participant group within the study. Participants were categorised by the various studies as adults (18 years old or over), children/adolescents (under 21 years) or all patients (all registered patients of a practice). Rates of missed appointments were similar for each group of participants, but studies that reported a rate of missed appointment amongst patients who were children/ adolescents^{23,36} were slightly higher than rates for adults or all-patients^{5,8,10,19,20,22,24,25,27,28,29,30,31,32,33,34,35,37,38,39,40} (Table 3).

Table 3 here

Rate of patients missing appointments

Two studies^{5,10} reported rate of patients missing appointments. Both considered the relationship between patient health and missed appointments. The first of these reported that 73% of patients missed one or more appointments during the study period with the highest rates found in patients with a psychological health diagnosis¹⁰. The second reported that 46.7% of patients missed one or more appointment, showing missed appointments were a significant marker for subsequent all-cause mortality particularly in those with a long-term mental health condition⁵.

Reasons for missed appointments

Twelve studies^{3,8,19,21,22,23,24,25,26,27,28,29} discussed reasons that appointments were missed which were categorised into two themes; patient centred reasons and clinic specific reasons- each with sub-themes identified (see Table 4).

Table 4 here

Patient centred reasons for missing appointments

Patient centred reasons for missing appointments included work or childcare commitments^{3,8,19,21,22,23,24}, patients forgetting appointments^{8,19,21,23,25}, difficulty with transport to and from the appointment^{8,19,21,22,23}, feeling too ill to attend^{8,21,24}, barriers relating to weather^{8,19,21} or feeling better by the time of the appointment^{8,19}.

Clinic/ practical reasons for missing appointments

Clinic specific reasons (reasons related to practical aspects of the clinic or process) included doctor patient relationships^{3,24,26}, appointments not being with patient's preferred GP^{8,21}, issues with the practice's booking system^{3,21,22}, miscommunication from the practice about appointment (for example, the wrong date or time being put on appointment cards)^{8,24,25}, day of the week (with Mondays being most mentioned)^{27,28,29}, or not receiving appointment reminders¹⁹.

Healthcare professional views on missed appointments

Three studies^{21,26,30} reported healthcare professionals' opinions for missed appointments, generally mirroring patient reported reasons. These included patients lacking in health knowledge, difficulty in cancelling appointments, issues around relationship between patient and GP, competing priorities from work and family commitments. Healthcare professionals also reported that patients missed appointments because they felt better, or could not be bothered to attend.

Characteristics of patients missing appointments

Of the studies included in this review, 20^{5,8,10,19,21,23,24,25,26,27,28,29,30,31,32,33,34,35,36,40} reported characteristics of patients missing appointments which were categorised into two main themes each with further sub-themes (Table 5).

Table 5 here

Health related factors

Patients with a mental health diagnosis^{5,8,10,21,31}, or with multiple or serious physical health conditions^{5,10,24,32} were more likely to miss appointments.

Demographic related factors

Patients were more likely to miss booked appointments if they were of lower socio-economic status or living in a deprived area,^{21,24,26,33,36} from a non-white or minority ethnicity group^{23,24,25,27,28,31,32,34}, reflecting areas of unmet need amongst already disadvantaged groups. Patients in receipt of Medicaid (state-funded health-coverage for eligible groups in US)⁴¹, or who are paying for their insurance themselves^{10,25,27,30}, or who were receiving publicly funded insurance^{23,34} were more likely to miss appointments. Both younger patients^{8,21,25,27,28,34}, and older patients^{10,33} were frequently reported as more likely to miss appointments. Some studies found females were more likely to miss appointments^{28,31,33}, whilst others found that males were more likely to miss appointments^{8,24}. Patients that have previously missed an appointment^{8,29,35} were reported as being more likely to miss appointments. Characteristics of appointments that were more frequently missed included scheduled Well-Child appointments^{23,36}, those that were booked on a date further away from the time of booking^{19,14,32}, and those that were booked at a practice located further away from where the patient lives³⁶.

Discussion

Summary

This review examined the rate of missed general practice appointments, reasons for missing appointments and which patients were more likely to miss appointments. The 19 studies that reported a rate of missed appointments showed that between 3.3-48.1% of appointments were missed, with a mean of 15.2%. The most frequently reported reasons for missed appointments included forgetting, work or family commitments and transport or weather difficulties. Patients that were most likely to miss an appointment included those that were younger, who had missed appointments previously, from low socio-economic backgrounds, and those with a mental health or physical diagnosis. All but one of the studies were given an overall rating of high quality. Our findings echo those found by George and Rubin,⁹ although much has changed in the primary care landscape this does not appear to be reflected in reduction in rates of missed appointments.

Strengths and limitations

This review's strength lies in its breadth as it covers all countries, all healthcare systems and all study designs providing a wide overview of the literature in the field. However, comparing different healthcare systems can be problematic, as rates and reasons for missed appointments are likely to be affected by the differing health care systems in different countries, differing payment structures and insurance systems.

Having different study designs makes it difficult to directly compare studies' results. Furthermore, different appointment systems across studies made direct comparison difficult. In intervention studies, baseline missed appointment rates were used but interventions may have been implemented where there was a known issue with the missed appointment rate and so may not be

typical. Exploring reasons given for missing appointments by grouping patient types has the potential to miss detail that relates to patient demographics, and our findings show that patient demographics have an impact on whether they are more likely to miss appointments.

Comparison with existing literature

Findings from this review are in line with an earlier systematic review, reporting similar rates of missed appointments in the US (5-55%) and the UK (2.9-11.7%).⁹ Reasons for missed appointments in the current review were in line with previous literature, including patients forgetting appointments, being too ill to attend^{8,9}, feeling better, work and family commitments and weather and transport problems⁸.

In line with the current review, previous research suggests that younger patients, those that previously missed appointments, low socio-economic status, psychological problems and those funded by the state or self-paying were more likely to miss appointments^{8,9}.

Implications for research and practice

This review has shown specific clinical issues which could be addressed to reduce missed appointments including reviewing booking systems and the availability of appointments with preferred clinicians.

Tailoring appointment scheduling to patient behaviours is a potential approach to reducing non-attendance, for example as patients who miss appointments are more likely to do so on a Monday, they could be encouraged to schedule non-urgent appointments on other days of the week.

The most cited patient centred reasons for missing appointments centre around patients' schedules for example, being related to taking time off work or finding childcare. Practices may wish to review their access systems or utilise the increase in remote consulting to offer a range of options if that better suits their practice population. Simply forgetting the appointment was also highly cited as a reason for missing an appointment and implementing reminder systems such as 'SMS' reminders which have been shown to work^{42,43}, would help with this.

Understanding characteristics of individuals most likely to miss appointments is useful in designing and planning appointment systems in general practice. This review highlights particular groups who are more likely to miss appointments, including those with a mental health diagnoses, those with multiple health conditions, those in ethnic minority groups, and those attending practices in areas of high deprivation. Deprivation has been shown to intersect with multimorbidity, mental health conditions, age and ethnicity^{44,45}, meaning that some practices will be addressing several factors at once when tackling missed appointments. Any intervention will need to address multiple patient characteristics, but is then likely to have the most impact on non-attendance.

Future research should examine whether consultation type impacts the rate of missed appointments, reflecting the rapid adoption of remote consulting as a response to COVID-19. This should include the impact on different patient groups particularly those that are both underserved and not attending. It may be that the move to remote consulting impacts on this group differently. Tailored interventions for specific population sub-groups with high rates of missed appointments could then be targeted for improvement. In the shorter-term practices can, as the pandemic progresses, audit their missed appointment levels and compare these to the pre-pandemic to look for change as a result of a change in access systems.

Future research needs to consider differences in missed appointments between initial consultations and follow-up appointments, and the potential impact of relational continuity on attendance.

This review is of research conducted pre-Covid-19 and it would be useful after the pandemic to consider changes made to the booking of appointments during the pandemic and whether this has had any impact on missed appointments as compared to before and during the pandemic.

Conclusion

Many studies did not clearly report on practice appointment booking systems therefore to understand its impact on missed appointment rates this needs to be the focus of future research. Changes in appointment delivery, accelerated by COVID-19, should be examined to understand their impact on missed appointments. To do this we need to explore with patients why they miss appointments, and to establish what would work to encourage them to cancel or attend appointments. Qualitative interviews with patients who both miss and do not miss appointments would be beneficial in achieving this aim.

Funding

No specific funding was obtained for this review.

Conflict of interests

None declared

Acknowledgements

The authors would like to thank the University Librarian Samantha Johnson for her help in developing and running the searches, and medical students Jo Gao and Adam Steege for help screening titles.

References

1. NHS England. Missed GP appointments costing NHS millions 2019 05.08.2019.
<https://www.england.nhs.uk/2019/01/missed-gp-appointments-costing-nhs-millions/2019/>
- 2 Fisher, R. F., Croxson, C. H., Ashdown, H. F., & Hobbs, F. R.. GP views on strategies to cope with increasing workload: a qualitative interview study. *Br J Gen Pract.* 2017; 67(655), e148-e156.
- 3 Martin, C., Perfect, T., & Mantle, G. Non-attendance in primary care: the views of patients and practices on its causes, impact and solutions. *Fam Pract.* 2005; 22(6), 638-643.
- 4 Martin, S. J., Bassi, S., & Dunbar-Rees, R. Commitments, norms and custard creams—a social influence approach to reducing did not attends (DNAs). *J R Soc Med.* 2012; 105(3), 101-104.
- 5 McQueenie R, Ellis DA, McConnachie A, et al.; Morbidity, mortality and missed appointments in healthcare: a national retrospective data linkage study. *BMC Med.* 2019; 17(1):2.
- 6 Williamson AE, Ellis DA, Wilson P, et al. Understanding repeated non-attendance in health services: a pilot analysis of administrative data and full study protocol for a national retrospective cohort. *BMJ Open.* 2017; 7(2):e014120.
- 7 Neal RD, Lawlor DA, Allgar V, et al. Missed appointments in general practice: retrospective data analysis from four practices. *Br J Gen Pract.* 2001; 51(471):830-2
- 8 Neal RD, Hussain-Gambles M, Allgar VL, et al. Reasons for and consequences of missed appointments in general practice in the UK: questionnaire survey and prospective review of medical records. *BMC Fam Pract.* 2005; 6(1):47.
- 9 George, A., & Rubin, G. Non-attendance in general practice: a systematic review and its implications for access to primary health care. *Fam Pract.* 2003; 20(2):178-84.
- 10 Cashman, S. B., Savageau, J. A., Lemay, C. A., & Ferguson, W. Patient health status and appointment keeping in an urban community health center. *J Health Care Poor Underserved.* 2004; 15(3), 474-488.
- 11 Campbell, J. L., Fletcher, E., Britten, N., et al. Telephone triage for management of same-day consultation requests in general practice (the ESTEEM trial): a cluster-randomised controlled trial and cost-consequence analysis. *Lancet.* 2014; 384(9957), 1859-1868.
- 12 Car, J., & Sheikh, A. Telephone consultations. *BMJ* 2003; 326(7396), 966-969.
- 13 Koshy, E., Car, J., & Majeed, A. (2008). Effectiveness of mobile-phone short message service (SMS) reminders for ophthalmology outpatient appointments: observational study. *BMC Ophthalmol.* 2008; 8(1), 9.
- 14 Castle-Clarke, S., & Imison, C. The digital patient: transforming primary care. *London: Nuffield Trust* 2016.

- 15 Moher, D., Liberati, A., Tetzlaff, J. & Altman, D.G. The PRISMA Group. Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. *PLoS Med.* 2009; 6(7): e1000097. doi:10.1371/journal.pmed1000097
16. Hong, Q.N., Pluye, P., Sergi, F. et al. Mixed Methods Appraisal Tool (MMAT), version 2018. 2018;1–11. Available from:
http://mixedmethodsappraisaltoolpublic.pbworks.com/w/file/fetch/127916259/MMAT_2018_criteria-manual_2018-08-01_ENG.pdf
- 17 Gault, J., Ross, J., Hall, I. et al. Pharmacy-based sexual health services: a systematic review of experiences and attitudes of pharmacy users and pharmacy staff. *Sex Transm Infect.* 2019; 95(7), 488-495.
- 18 Popay, J., Roberts, H., Sowden, A. et al. Guidance on the conduct of narrative synthesis in systematic reviews. A product from the ESRC methods programme Version 2006;1:b92.
- 19 Shahab, I. & Meili, R. Examining non-attendance of doctor's appointments at a community clinic in Saskatoon. *Can Fam Physician.* 2019; 65(6):e264-8.
- 20 Leong, K.C., Chen, W.S., Leong, K.W. et al. The use of text messaging to improve attendance in primary care: a randomized controlled trial. *Fam Pract.* 2006; 23(6):699-705.
- 21 Husain-Gambles, M., Neal, R.D., Dempsey, O. et al. Missed appointments in primary care: questionnaire and focus group study of health professionals. *Br J Gen Pract.* 2004; 54(499):108-13.
- 22 Lacy, N.L., Paulman, A., Reuter, M.D. & Lovejoy, B. Why we don't come: patient perceptions on no-shows. *Ann Fam Med.* 2004; 2(6):541-5.
- 23 Samuels, R.C., Ward, V.L., Melvin, P., et al. Missed appointments: factors contributing to high no-show rates in an urban pediatrics primary care clinic. *Clin Pediatr (Phila)* 2015; 54(10):976-82.
- 24 Zailinawati, A.H., Ng, C.J., & Nik-Sherina, H. Why do patients with chronic illnesses fail to keep their appointments? A telephone interview. *Asia Pac J Public Health* 2006; 18(1):10-5.
- 25 Kaplan-Lewis, E. & Percac-Lima, S. No-show to primary care appointments: why patients do not come. *J Prim Care Community Health* 2013; 4(4):251-5.
- 26 Akter, S., Doran, F., Avila, C. & Nancarrow, S. A qualitative study of staff perspectives of patient non-attendance in a regional primary healthcare setting. *Australas Med J.* 2014; 7(5):218.
- 27 Bennett, K.J. & Baxley, E.G. The effect of a carve-out advanced access scheduling system on no-show rates. *Fam Med.* 2009; 41(1):51.
- 28 Nancarrow, S., Bradbury, J. & Avila, C. Factors associated with non-attendance in a general practice super clinic population in regional Australia: A retrospective cohort study. *Australas Med J.* 2014; 7(8):323.
- 29 Norris, J.B., Kumar, C., Chand, S. et al. An empirical investigation into factors affecting patient cancellations and no-shows at outpatient clinics. *Decision Support Systems* 2012; 57:428-43.

- 30 Johnson, B.J., Mold, J.W. & Pontious, J.M. Reduction and management of no-shows by family medicine residency practice exemplars. *Ann Fam Med.* 2007; 5(6):534-9.
- 31 Boos, E.M., Bittner, M.J. & Kramer, M.R. A profile of patients who fail to keep appointments in a Veterans Affairs primary care clinic. *WMJ* 2016; 115(4):185-90.
- 32 Shimotsu, S., Roehrl, A., McCarty, M. et al. Increased likelihood of missed appointments ("no shows") for racial/ethnic minorities in a safety net health system. *J Prim Care Community Health* 2016; 7(1):38-40.
- 33 Ellis, D.A., McQueenie, R., McConnachie, A. et al. Demographic and practice factors predicting repeated non-attendance in primary care: a national retrospective cohort analysis. *Lancet Public Health* 2017; 2(12):e551-9.
- 34 Lasser, K.E., Mintzer, I.L., Lambert, A. et al. Missed appointment rates in primary care: the importance of site of care. *J Health Care Poor Underserved* 2005; 16(3):475-86.
- 35 Steiner, J.F., Shainline, M.R., Bishop, M.C. & Xu, S. Reducing Missed Primary Care Appointments in a Learning Health System. *Med care* 2016; 54(7):689-96.
- 36 Wallace, D.J., Ray, K.N., Degan, A. et al. Transportation characteristics associated with non-arrivals to paediatric clinic appointments: a retrospective analysis of 51 580 scheduled visits. *BMJ Qual Saf.* 2018; 27(6):437-44.
- 37 Belardi, F.G., Weir, S. & Craig, F.W. A controlled trial of an advanced access appointment system in a residency family medicine center. *Fam Med* 2004; 36(5):341-5.
- 38 Cameron, S., Sadler, L. & Lawson, B. Adoption of open-access scheduling in an academic family practice. *Can Fam Physician* 2010; 56(9):906-11.
- 39 Ellis, D.A. & Jenkins, R. Weekday affects attendance rate for medical appointments: large-scale data analysis and implications. *PloS One*. 2012; 7(12):e51365.
- 40 Nguyen, D.L., DeJesus, R.S. & Wieland, M.L. Missed appointments in resident continuity clinic: patient characteristics and health care outcomes. *J Grad Med Educ.* 2011; 3(3):350-5.
- 41 Medicaid. 2020. <https://www.medicaid.gov/medicaid/index.html>
- 42 Boksmati, N., Butler-Henderson, K., Anderson, K., Sahama, T. The effectiveness of SMS reminders on appointment attendance: a meta-analysis. *Journal of medical systems*. 2016 Apr 1;40(4):90.
- 43 Robotham, D., Satkunanathan, S., Reynolds, J., Stahl, D., Wykes, T. Using digital notifications to improve attendance in clinic: systematic review and meta-analysis. *BMJ open*. 2016 Oct 1;6(10).
- 44 Barnett, K., Mercer, S.W., Norbury, M., Watt, G., Wyke, S., Guthrie, B. Epidemiology of multimorbidity and implications for health care, research, and medical education: a cross-sectional study. *The Lancet*. 2012 Jul 7;380(9836):37-43.
- 45 Violan, C., Foguet-Boreu, Q., Flores-Mateo, G., Salisbury, C., Blom, J., Freitag, M., Glynn, L., Muth, C., Valderas, J.M. Prevalence, determinants and patterns of multimorbidity in primary care: a systematic review of observational studies. *PloS one*. 2014 Jul 21;9(7):e102149.

Table 1. Characteristics of included studies

Characteristics	Number of included studies (n)
Country	
US	14
UK	6
Australia	2
Canada	2
Malaysia	2
Date study undertaken	
2004-2009	11
2010-2014	8
2015-2019	7
Study design	
Cross sectional	15
Non-randomised controlled trial	5
Qualitative	4
Randomised controlled trial	2
Population	
All registered patients	17
Adults (over 18 years old)	4
Healthcare staff	3
Children/ adolescents (under 21 years old)	2
Healthcare system	
Universal healthcare (UK)	6
Healthcare which is a mix of government funded and private insurance (majority government funded) (Canada, Australia and Malaysia)	6
Private health insurance and public health coverage (majority private insurance) (USA)	14

Table 2. Rate of missed appointment by country of study.

Country	Number of studies reporting rate	Rate of missed appointment
US	12	4.4-29.8% (Mean 14.5%)
UK	2	5.2% and 12.1%
Australia	1	7.6%
Canada	2	24.6% and 3.3%
Malaysia	2	48.1% and 16.7%

Table 3. Rate of missed appointment by age group of participants

Age group	Number of studies reporting rate	Rate of missed appointment	Mean rate (if applicable)
Adults	3	16.3- 24.6%	19.1%
Children/ adolescents	2	20.4% and 29.8%	
All-patients	14	4.4- 48.1%	13.3%

Table 4. Frequency of reasons for missed appointments

Themes	Frequency. How many studies reported the reason
Patient centred reasons	
Work or family issues	8
Forgot appointment	5
Transportation issues	5
Too unwell	3
Weather	3
Felt better	2
Other issues: couldn't be bothered, was in hospital, not aware of date, death in family each mentioned once	1
Clinic specific reasons	
Doctor patient relationship issues (incl. not with preferred GP and doctor reasons)	5
Issues with booking system	3
Miscommunication	3
Monday appointment	3
Not receiving a reminder	1

Table 5. Characteristics of patients missing appointments

Characteristic	Frequency. How many studies characteristics were reported in (refs)
Health related factors	
Presence of mental health diagnosis	5
Presence of at least one physical health condition	4
Demographic related factors	
<i>Socio-economic status</i>	
Minority/ non-white patients	8
Low socio-demographic status/ deprived areas	5
Poor education	1
<i>Insurance status</i>	
Medicaid or self-pay	4
Publically funded insurance	2
<i>Age</i>	
Younger patients	8
Older patients	4
Patients aged 20-39	1
<i>Gender</i>	
Female	3
Male	2
<i>Patient status</i>	
Patients who have previously missed appointments	3
New patients	1
<i>Type of appointment</i>	
Appointment booked further away	3
Scheduled Well-child appointment	2
Live further away from appointment location	1

Accepted Manuscript - BJGP - BJGP.2020.1017