BJGP OPEN

Analysis of in-person general practice respiratory consultations: assessing translatability to telehealth

Raghuraman, Sunayana; Ramarao, Jayashanthi; Lane, Jared; Ward, Kanesha; Lau, Annie

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 BJGP Open, 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

ANALYSIS OF IN-PERSON GENERAL PRACTICE RESPIRATORY CONSULTATIONS: ASSESSING TRANSLATABILITY TO TELEHEALTH

SUNAYANA RAGHURAMAN[1,2] (MD, BPHTY (HONS I)), MEDICAL OFFICER

JAYASHANTHI RAMARAO[1,3] (MD, BBIOMEDSC), MEDICAL OFFICER

JARED LANE[1] (MPH), SCIENTIST

KANESHA WARD[1] (BCLINSCI, MRES), SCIENTIST

ANNIE Y.S. LAU[1] (BE, PHD), SENIOR RESEARCH FELLOW

[1] CENTRE FOR HEALTH INFORMATICS, AUSTRALIAN INSTITUTE OF HEALTH INNOVATION, MACQUARIE UNIVERSITY, SYDNEY, AUSTRALIA

[2] WESTMEAD HOSPITAL, WESTERN SYDNEY LOCAL HEALTH DISTRICT, NSW HEALTH, SYDNEY, AUSTRALIA

[3] LIVERPOOL HOSPITAL, SOUTH WESTERN SYDNEY LOCAL HEALTH DISTRICT, NSW HEALTH, SYDNEY, AUSTRALIA

CORRESPONDING AUTHOR: SUNAYANA.RAGHURAMAN@HEALTH.NSW.GOV.AU

ABSTRACT

Background: The COVID-19 pandemic saw multiple general-practitioners (GPs) adopt telehealth as a consultation modality to minimise disease transmission. Patients presenting with respiratory ailments were particularly affected by this transition, given the overlap of general respiratory symptoms with those of COVID-19. It is unclear if the rapid transition to telehealth has compromised the ability to conduct certain tasks that were possible during in-person consultations.

Aim: To investigate the extent to which tasks observed during in-person GP consultations are replicable to telehealth, focusing on patients with respiratory concerns.

Design and Setting: 26 respiratory consultations were extracted from a database of 281 consultations collated from various general practices in the UK.

Method: Interactions between GPs and respiratory patients were assessed through in-depth transcript review and de-identified video analysis. Then, tasks performed and physical artefacts utilised during the consultations were identified and ranked in terms of their translatability to telehealth using a newly developed scoring system.

Results: Overall, the translatability to telehealth score for these respiratory consultations was 6.7/10, suggesting that many tasks can be replicated over telehealth, but may require additional physical artefacts to support this. However, some tasks are not currently amenable to telehealth (e.g. auscultation).

Conclusion: Whilst many aspects of respiratory consultations are replicable over telehealth, some tasks are unable to be replicated at this stage.

How this fits in

Given the increasing role of telehealth as a healthcare modality, it is insightful to identify the tasks that are present during in-person consultations between GPs and patients to assess how these can be replicated in telehealth. To our knowledge, there is no current research that investigates how translatable different in-person respiratory consultation tasks are to telehealth. This study aims to address this gap by not only evaluating the translatability of various clinical tasks performed for respiratory patients in general practice, but also to assess whether a scoring system can be developed to quantify this.

1.0. INTRODUCTION

Telehealth is a consultation modality that involves clinical interactions occurring remotely through either video or audio calls. Whilst telehealth has been utilised by healthcare practitioners prior to COVID-19, the pandemic resulted in a rapid uptake of telehealth across the globe within a short period of time[1-4]. Given the overlap in symptoms with many respiratory conditions and those of COVID-19, numerous patients with respiratory ailments had to resort to telehealth consultations to minimise disease transmission. In the United Kingdom (UK), nearly 1 in 5 patients is diagnosed with a respiratory condition in their lifetime[5]. One cohort study of patients in South-West England showed that since the COVID-19 pandemic, the number of patients presenting to their GP with a respiratory complaint had increased by 229%, with a 105% increase in home visits, 92% increase in office visits, 250% increase in phone consultations and a 1,574% increase in video/email (i.e. telehealth) consultations[6].

Respiratory conditions (e.g. viral illnesses, asthma, chronic obstructive pulmonary disease [COPD]) are one of the most common reasons for a patient to visit a general practice [7, 8, 9]. Some respiratory ailments can be debilitating, impede quality of life, impact mental health and, if improperly managed, increase the risk of morbidity and mortality, subsequently burdening the healthcare system[9, 10]. Being the gatekeepers into the healthcare system, GPs are well situated to monitor and manage respiratory conditions to prevent exacerbations and reduce hospital admissions[11, 12, 13].

A new body of literature investigating the efficacy of telehealth for patients with respiratory concerns during the COVID-19 pandemic is slowly emerging. Studies by McGee et al (2020) and Phillips et al (2020), to name a few, have found that telehealth is an effective modality for delivering healthcare[14, 15]. However, no studies to our knowledge have investigated the tasks performed during in-person respiratory consultations in general practice, and analysed which aspects are translatable to telehealth and what physical objects/artefacts are required to support this.

The aim of this study is to provide an insight into the tasks and physical artefacts utilised during in-person GP consultations and subsequently determine if these are translatable to the context of telehealth in respiratory patients. This study is unique in that it evaluates actual interactions between GPs and patients, rather than relying on self-reported data which may be amenable to recall or confirmation bias[16].

2.0. METHODS

2.1. Study Design

This study is a secondary analysis of both written transcripts and de-identified videos of primary care consultations between GPs and patients in the UK. The data was collected in an NHS-ethical approved project entitled: "Harnessing resources from the internet to maximise outcomes from GP consultations (HaRI)' study: a mixed methods study" (REC reference: 16/LO/1029; IRAS project ID: 197875)[17].

2.2. Data Collection

The original dataset of 281 consultations (in transcripts and videos) were retrieved from 10 GPs across 8 general practices in different locations across South-East England in 2017. Consultations between GPs and patients were de-identified, transcribed verbatim and summarised into an SPSS Metadata file. Two researchers (SR and JR) reviewed the transcripts and employed inclusion and exclusion criteria to isolate relevant respiratory

consultations (see Supplementary Data Section 1). The inclusion criteria included consultations:

- Obtained from the original HaRI database
- That discussed a respiratory concern
- Where consent was obtained for the use of both written transcripts and de-identified videos.

The exclusion criteria included consultations where:

- Consent was declined
- No clear discussion surrounding a respiratory complaint occurred.

2.3. Data Analysis

Patient Privacy and Confidentiality

To maintain privacy and confidentiality, a custom-made software program was developed and applied to the consultation videos to obscure patients' and clinicians' faces.

Descriptive Analysis

Descriptive statistical analysis detailing patient demographics was compiled from the isolated respiratory transcripts (see Supplementary Data Section 2 [Table S1]).

Video and Transcript Analysis

Two independent reviewers (SR and JR) conducted an in-depth analysis of the written transcripts using a similar framework to that of Kocabelli et al[18]. Kocabelli et al (2019) assessed various patient transcripts and transcribed every single event that occured[18]. Similarly, inductive analysis was employed in this study by identifying and documenting every task that was occurring and what physical artefacts were utilised for these tasks. The identified tasks were documented and coded (i.e. grouped) utilising the N-Vivo software[19]. Furthermore, corresponding de-identified videos of the transcripts were analysed to note any additional tasks and/or artefacts that were not identified during the transcript review.

The identified physical artefacts were sub-categorised into objects that were likely to be accessible in a patient's home, thus amenable to use in telehealth consultations, and objects

that were not. This was based on the availability of the equipment in an average pharmacy in a developed nation (e.g. Boots in the UK).

Translatability to Telehealth Analysis

From the inductive analysis conducted above, it was noted that two basic domains underpinned whether the observed tasks would be amenable to Telehealth: whether clinical expertise was required (e.g. physical examination skills) and whether supplementary physical artefacts were required (e.g. thermometer). A separate co-study by co-author JL found that these domains underpinned the analysis of cardiovascular transcripts as well[20]. Based on this, a scoring system was developed by researchers (SR, AL, JL, KW), to investigate the extent to which various tasks were amenable to telehealth. This scoring system was inspired by Croymans et al[21], who assessed various presenting complaints and categorised them into health conditions that were suitable for telehealth compared to those that were not. This made the authors contemplate whether various clinical tasks, rather than conditions, could be categorised to determine if certain tasks were more amenable to telehealth than others.

This scoring system was developed through collaborative discussions between the researchers, review of relevant literature and in-depth analysis of the transcripts. The following steps were utilised to develop the scoring system, which ultimately provided a 'Translatability to Healthcare Score':

1) Each task was rated based on the requirement of 'clinical endorsement'. A score=1 when medical accreditation/training was required (e.g. prescribing) and a score=5 where clinical endorsement was not necessarily required (e.g. formal greeting)
2) Each task was then rated based on the need for physical artefacts/interactions for execution. A score=1 for physical artefacts currently unlikely to be replicated over telehealth (e.g. auscultation) to a score=5, where physical artefacts are not required and thus readily amenable to telehealth (e.g. history-taking).
3) The scores from steps 1 and 2 were combined to provide a 'Translatability to telehealth score' (x/10) [refer to Table 2]. A higher score equated increased translatability to telehealth.

4) Based on the Translatability to telehealth score, each task was categorised into a Virtual Care Solution (refer to Table 3).

Thus, the scoring system was developed after evaluating the data (inductive analysis) and was then re-applied to the clinical tasks to see if they could be categorised using this method (deductive analysis). See Supplementary Data Section 1 (Figure S1 and S2) for diagrammatic representation of methods.

Table 1: Detailed Metrics used to score Translatability of in-person Tasks to Telehealth

Metric 1: Clinical Endorsement Score	
Score	Description
1/5	Medical expertise is necessary for tasks that can only be performed in-person (e.g. giving flu injections, auscultation*)
2/5	In-person medical expertise is preferred, but some digital solutions are available in an outpatient setting, although not in the patient's home (e.g. outpatient spirometry)
3/5	Medical endorsement is required for interpretation of results, that the patient can collect in their homes (e.g. home temperature monitoring), as well as for tasks that have current digital solutions (e.g. provide electronic referrals, electronic prescriptions to pharmacy, medical certificates etc)
4/5	Medical expertise is required for tasks, such as targeted history taking, but no specific equipment is required, making it easy to perform over telehealth
5/5	Medical expertise is not necessarily required to complete this task (e.g. formal greeting)
Metric 2: Physical Artefacts or Physical Interactions Score	
Score	Description
1/5	Requires physical artefacts for execution in a manner that is currently not easily translatable over telehealth (e.g. auscultation*)
2/5	Requires equipment that is currently not accessible in the home, but results could be discussed over telehealth (e.g. x-ray, spirometry)
3/5	Requires equipment that is easily purchasable in most pharmacies, as verified against pharmacy catalogues in the UK/Australia i.e. Boots, Chemist Warehouse (e.g. purchasing a peak flow meter)
4/5	Requires equipment that is relatively easily accessible in many homes, thus is able to be translated over telehealth (e.g. thermometer)

5/5	Does not require any equipment, thus readily translatable over telehealth (e.g. discussing smoking status)
*In some circumstances, auscultation may be considered a 2/5 as new technology for remote auscultation is developing. However, this technology is expensive and not yet readily available; thus, it has been rated 1/5 in this circumstance.	

Table 2: Translatability to Telehealth Score Interpretation

Metric 1: Clinical Endorsement score	Metric 2: Physical Artefacts or Interactions score				
	5	4	3	2	1
5	10	9	8	7	6
4	9	8	7	6	5
3	8	7	6	5	4
2	7	6	5	4	3
1	6	5	4	3	2
Interpretation					
9-10/10= Easily translatable over telehealth with almost no additional equipment being required= Type 5					
7-8/10= Relatively easy to translate over telehealth, with minimal but easily accessible equipment required= Type 4					
5-6/10= Can be translated over telehealth but may require the patient to acquire their own additional equipment to do so= Type 3					
4/10= Can be translated over telehealth but may require the patient to undergo additional steps e.g. outpatient investigations = Type 2					

2-3/10= Not amenable to being replicated over telehealth at this stage= Type 1

Table 3: Virtual Care Solution Types

Virtual Care Solution Type	Interpretation
Type 5	Tasks that are easily translatable over telehealth (e.g. history taking, test result interpretation)
Type 4	Tasks that are relatively easy to translate to telehealth with minimal and easily accessible equipment (e.g. patients recording own temperature at home and communicating findings to GP)
Type 3	Tasks that are moderately translatable to the context of telehealth but may require the patient to purchase additional physical artefacts available in a pharmacy to support this (e.g. purchasing a peak flow meter)
Type 2	Tasks that cannot necessarily be supported with physical artefacts at home, but investigations can be performed as an outpatient and discussed virtually (e.g.

	chest x-ray interpretation, spirometry results)
Type 1	Tasks that require in-person consultations to effectively execute, thus are not amenable to telehealth at this stage (e.g. auscultation)

3.0. RESULTS

3.1. Patient and Consultation Characteristics

After applying inclusion and exclusion criteria to the dataset of 281 transcripts, 26 transcripts discussing respiratory illnesses in a general practice setting were extracted. These transcripts included acute and chronic presentations across all age-ranges, with a variety of objective and subjective measures of respiratory function (see *Supplementary Data Section 2 [Table S1]).*

3.2 Physical Artefacts Utilised and Their Replicability in Patients' Homes

Sixteen physical artefacts were identified, of which 8 (50%) were deemed amenable to being replicated in telehealth, whereas 8 (50%) were not, due to equipment availability or requirement for operator expertise (see Supplementary Data Section 5 and Section 6 [Tables S4, S5 and S6])
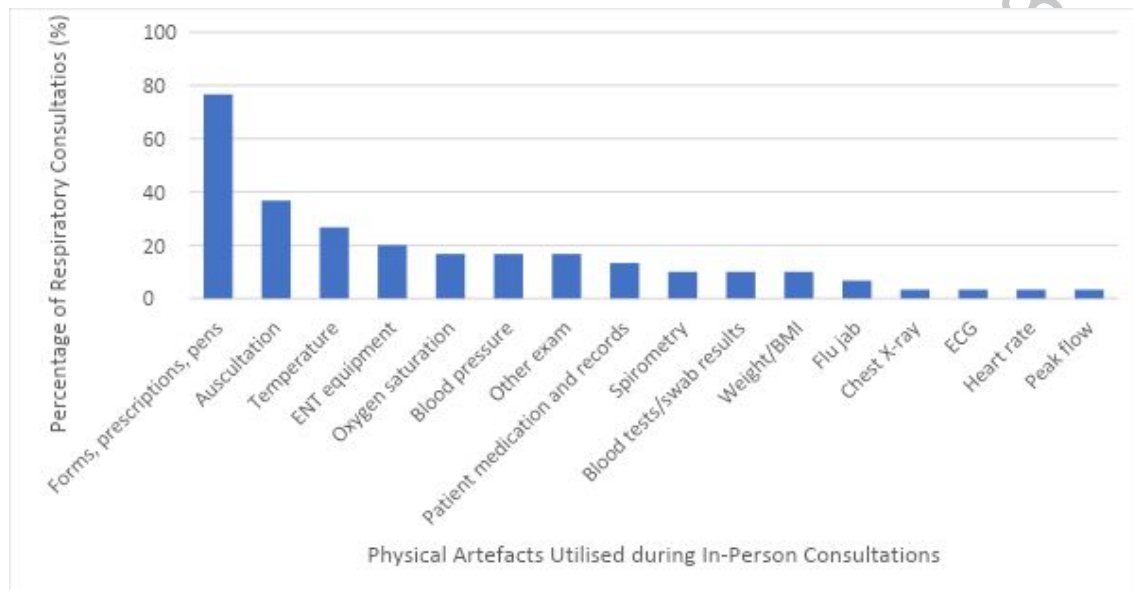
Figure 1: Frequency of Physical artefacts used in respiratory consultations (n=26)

*Note: some consultations incorporate multiple artefacts within the same encounter

3.3. Tasks Performed and Translatability to Telehealth

Table S2 in Supplementary Data Section 3 outlines the tasks identified during in-person consultations relating to respiratory concerns. See Supplementary Data Section 5 (Table S4) for examples of rationales regarding scoring for various tasks.

Across these 20 tasks, the mean score for the telehealth metrics were:

- Requiring Healthcare Endorsement= 3.1/5 (where '1= clinical expertise is necessary', to '5= clinical expertise is not required')

- Requiring Physical Artefacts/Interactions= 3.6/5 (where '1=requires physical artefacts/interactions that are not translatable to telehealth' to '5=no physical artefacts/interactions required')
- Translatability to telehealth Score= 6.7/10 (where '1= not replicable to telehealth at this stage' to '10= easily replicable over telehealth at this stage')

Each of these 20 tasks were then categorised into a Virtual Care Solution type (see Table 3). Overall, the proportions of Virtual Care Solution Types were:

- Type-1 (tasks not translatable to telehealth, thus requiring in-person consults) = 15% (3/20) i.e. auscultation, ENT examination, flu injections
- Type-2 (tasks that cannot be performed at home, but can be performed as an outpatient with results discussed virtually) = 10% (2/20) i.e. spirometry results, blood tests and x-rays
- Type-3 (moderately translatable to telehealth but may require supplementation with further physical artefacts) = 10% (2/20) i.e. completing Power of Attorney paperwork, measuring peak flow
- Type-4 (easily translatable over telehealth with easily accessible equipment) = 30% (5/20) i.e. measuring vital signs, providing medical certificates, prescribing medications
- Type-5 (easily translatable over telehealth without the need for physical artefacts) = 40% (8/20) i.e. formal greetings/farewells, history-taking, patient education, safety netting

3.4 Clinical Tasks Performed During In-Person Consultations

Figure 2 summarises the frequency of the tasks described in Table S2 in history-taking, examination, and management respectively.
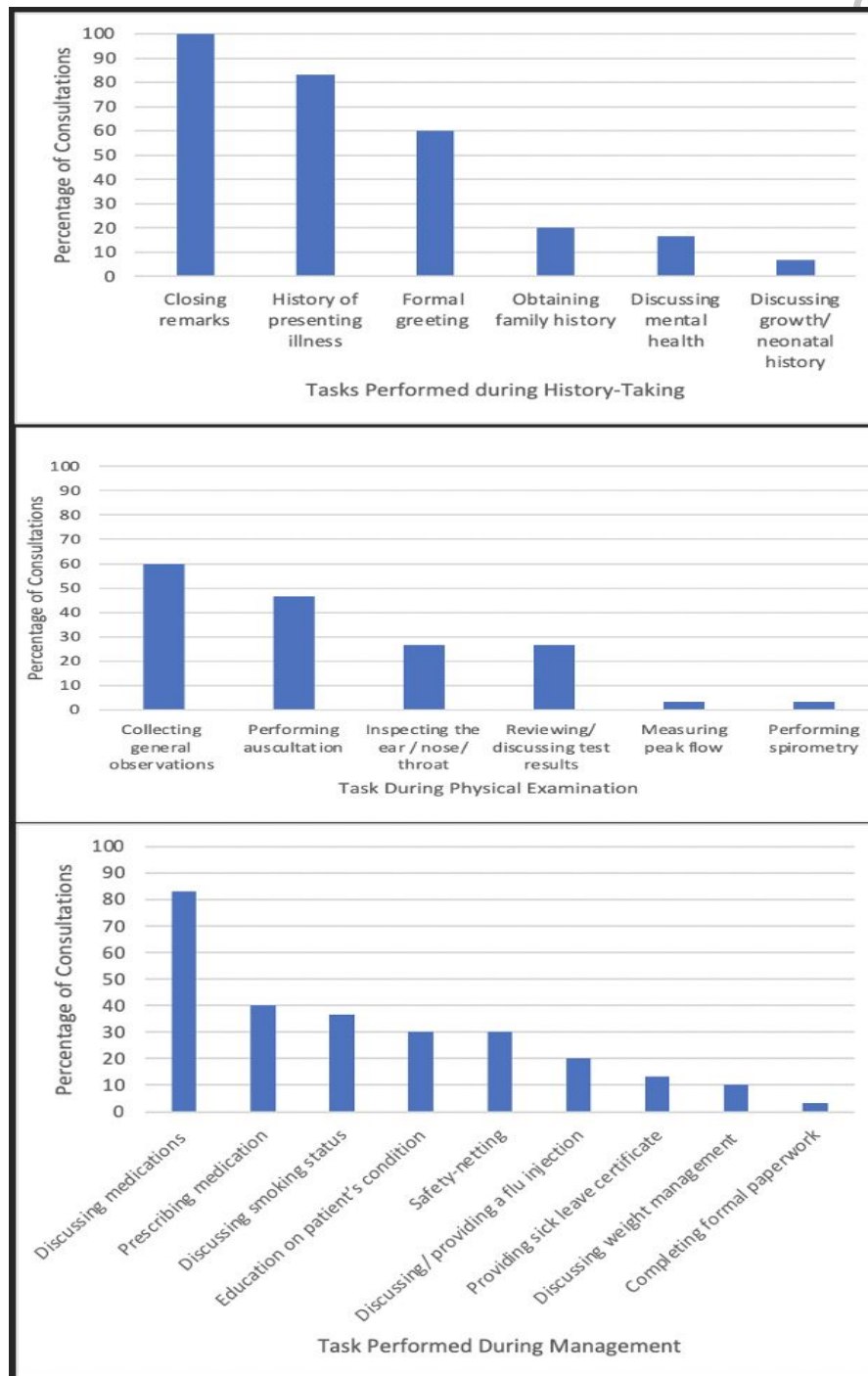

Figure 2: Frequency of Clinical Tasks performed in respiratory consultations (n=26)
*Note: some consultations incorporate multiple tasks within the same encounter

4.0 DISCUSSION

4.1. Summary

The mean *Translatability to telehealth* score was 6.7/10, suggesting many tasks can be replicated over telehealth, but may require additional physical artefacts. It was noted that 50% (8/16) of the physical artefacts utilised were deemed to be accessible in patients' homes or available for purchase at most pharmacies, whilst the other 50% (8/16) were not. The physical artefacts that were deemed possible to replicate in a patient's home included: pens/paperwork/prescriptions (e.g. online scripts), thermometer, oxygen saturation monitor, blood pressure cuff, patient medication lists/patient-made notes, weighing scale, heart rate monitor and peak flow meter. Physical artefacts/tasks that were deemed to be difficult to replicate in a patient's home included auscultation (as requires clinical expertise), ENT examination (e.g. otoscopy), spirometry, blood tests, flu injections, chest x-rays and ECGs. These findings could assist GPs conducting remote respiratory consultations, by helping them consider what additional tasks/artefacts a patient requires to achieve a successful respiratory telehealth consult.

4.2. Strengths and limitations

This study adopted a unique methodology that comprised of analysing actual GP-patient interactions during in-person consultations, rather than questionnaires or interviews, to facilitate objective analysis of tasks and reduce the risk of recall-bias. Furthermore, the analysed consultations involved variable sociodemographic features and both acute and chronic respiratory complaints, which assists with extrapolation of the findings to a wider population. Finally, the scoring system developed is unique and, to our knowledge, the first to quantify the translatability of tasks to telehealth.

Whilst the consultations incorporated patients with various sociodemographic characteristics, they were all located in South-East England. This impacts the ability to extrapolate the findings to UK primary care overall, as different areas of the UK have variable prevalence and mortality rates of different respiratory conditions. For example, pneumonias had a higher number of deaths in South-East England compared to lung cancer

and COPD; whereas COPD and lung cancer were associated with a higher number of deaths than pneumonia in Northwest England[22].

Some aspects of the consultations were performed behind curtains for patient privacy, thus were unable to be adequately evaluated. Furthermore, the categorisation of some tasks can be subjective. For example, flu vaccinations were given a Translatability to Telehealth score of 2/10, as the observed consultation video involved in-person interactions to administer the injection. However, patients could be referred to a pharmacy and still obtain the same treatment (i.e. Translatability to Telehealth score of 3/10). Additionally, some of the task categorisations assume that the consumer has access and financial means to purchase additional physical artefacts if needed. This is a limitation, as some regions that would benefit from telehealth (e.g. rural/ regional communities) may be unable to easily access resources required to supplement virtual appointments. The accuracy of measurements taken by patients in their homes can also be difficult to verify, which may obscure a patient's clinical picture and potentially lead to misdiagnosis.

Given that the Translatability to Telehealth score and the preceding inductive data analysis to develop the score were conducted by the same group of authors, there is a potential confirmation bias, despite attempts to remain objective throughout. For this reason, the authors would advocate for the Translatability to Telehealth score to be applied to different patient populations to ascertain its efficacy.

Finally, it is difficult to capture the complexities of human interactions within a scoring system, as a lot of subtleties (e.g. body language) can be lost. This is a potential limitation of telehealth, as it could negatively impact the development of patient and practitioner rapport. However, given human behaviour and interactions are highly variable, it is difficult to make the scoring system more specific, which suggests that the primary benefit of the Translatability to Telehealth score is as a broad categorisation tool.

4.3. Comparison with existing literature

A literature review demonstrated that telehealth can be just as effective as in-person appointments in certain contexts. Fox et al (2022) found that regularly scheduled telehealth

appointments, with an 'alert system', in exacerbation-prone patients with COPD reduced the number of unscheduled GP consultations and reduced associated healthcare costs[23]. Phillips et al (2021) found that there was no significant difference in the rate of related follow-ups, including hospital admissions and emergency department visits, in respiratory patients that had undergone either an initial telehealth visit, or in-person visit[15]. Totten et al (2016) conducted a systematic synthesis of 58 articles and found telehealth improved patient outcomes in chronic health conditions, including respiratory conditions[24].

Davis et al (2020) assessed perceptions regarding telehealth in patients with cystic fibrosis and found over 70% were satisfied with their telehealth experience, but some expressed concerns regarding a lack of in-person investigations (e.g. sputum sample)[25]. Clinicians' perspectives on telehealth remains divided. Althobiani et al (2021) found that clinicians thought telehealth was a useful tool to monitor patients with interstitial lung disease, albeit recognising further research pertaining to clinical outcomes was required[26]. Phimphasone-Brady et al (2021) noted that telehealth introduces new barriers and exacerbates some disparities, such as negatively impacting those of lower socioeconomic backgrounds, elderly individuals that may be unfamiliar with technology and patients of non-English speaking backgrounds[27].

4.4. Implications for Research and/or Practice

Given the rapid uptake of telehealth in recent years, new guidelines and recommendations have been developed to assist clinicians with conducting telehealth consultations[14,28]. Our clinical findings could assist with the development of such resources, by quantifying which tasks are amenable to telehealth.

Some equipment is not readily available in a patient's home, thus may not be amenable to telehealth at this point in time (e.g. spirometry). However, further research and development in medical technology may allow for some of these measures to be made replicable in a home environment in the future (e.g. compact spirometry devices). Although, despite advances in technology, some measures may still be difficult to translate to telehealth, such as physical examinations.

It is important to consider the impact of technology on the GP-patient relationship. In some consultations, in-person appointments facilitated the GP-patient therapeutic relationship, which was conducive to further management (e.g., opportunistic smoking cessation). Further research to investigate if this translates to the context of telehealth would be beneficial.

To determine the efficacy of the Translatability to Telehealth score as a broad categorisation tool, it would be useful to apply the scoring system to different patient populations (e.g. other health conditions, wider respiratory population).

5.0 CONCLUSION

In conclusion, this paper aimed to assess what in-person tasks were occurring in respiratory consultations with GPs and if these were amenable to telehealth. The Translatability to Telehealth score was established to quantify the extent to which certain tasks were amenable to telehealth. By understanding which tasks are amenable to telehealth, and which tasks are not, clinicians would be better positioned to understand which tasks can be conducted remotely.

Whilst telehealth appointments are beneficial, there are some instances where in-patient appointments are still required (e.g. lower socioeconomic background, difficulty navigating technology). Thus, it is important that in-person GP appointments continue to remain an option.

Notes

Research Excellence in Digital Technology to Transform Chronic Disease Outcomes (ID 1170937).

Provenance

Freely submitted; external peer-review

Acknowledgements

Competing Interest

There were no notable competing interests identified in the development of this project.

Funding Statement

Ethics

Ethics approval for this project was obtained from Macquarie University Human Research Ethics Committee for Medical Sciences (reference number: 52020558018892). The data was collected in an NHS-ethical approved project entitled: "Harnessing resources from the internet to maximise outcomes from GP consultations (HaRI)' study: a mixed methods study (REC reference: 16/LO/1029; IRAS project ID: 197875).

Reference List

1. Neves AL, Li E, Gupta PP, Fontana G, Darzi A. Virtual primary care in high-income countries during the COVID-19 pandemic: Policy Responses and lessons for the future. Euro J of Gen Practice. 2021; 27(1): 241-247

2. Snowsell CL, Caffery LJ, Haydon HM, Thomas EE, Smith AC. Telehealth uptake in general practice as a result of the coronavirus (COVID-19) pandemic. Aus Health Rev. 2020; 44:737-740

3. Schulz T, Long K, Kanhutu K, Bayrak I, Johnson D, Fazio T. Telehealth during the coronavirus disease 2019 pandemic: Rapid expansion of telehealth outpatient use during a pandemic is possible if the programme is previously established. J Telemed Telecare. 2020; 28(6):445-451. doi:10.1177/1357633X20942045

4. Koonin LM, Hoots B, Tsang CA, et al. Trends in the Use of Telehealth During the Emergence of the COVID-19 Pandemic - United States, January-March 2020. MMWR Morb Mortal Wkly Rep. 2020; 69(43):1595-1599. doi:10.15585/mmwr.mm6943a3

5. Snell N, Strachan D, Hubbard R, Gibson J, Limb E, Gupta R, Martin A, Laffan M, Jarrold I. Burden of lung disease in the UK; findings from the British Lung Foundation's 'respiratory health of the nation' project. Europ Resp J. 2016; 48

6. Dambha-Miller H, Hounkpatin HO, Morgan0Harrisskitt J, Stuart B, Fraser SD, Roderick P. Primary care consultations for respiratory tract symptoms during the COVID-19 pandemic: a cohort study including 70,000 people in South West England. Fam Practice. 2022;39(3):440-446.

7. Cooke G, Valenti L, Glasziou P, Britt H. Common general practice presentations andpublication frequency. Aus Family Phys. 2013; 42(2): 65-68.

8. The Department of Health. Chronic respiratory conditions- including asthma and chronic obstructive pulmonary disease (COPD). [Internet]. 2018 [Updated 2018 Apr 03, Cited 2020 Apr 27]. Available from:
https://www1.health.gov.au/internet/main/publishing.nsf/Content/chronic -respiratory.com

9. Marx G, Nasse M, Stanze H, Boakye SO, Nauck F, Schneider N. Meaning of living with severe chronic obstructive lung disease: a qualitative study. BMJ Open. 2016;6:e011555

10. Brunton L, Bower P, Sanders C. The Contradictions of Telehealth User Experience in Chronic Obstructive Pulmonary Disease (COPD): A Qualitative Meta-Synthesis. PLoS One. 2015; 10(10): e0139561

11. Lenferink A, Brusse-Keizer M, van der Valk WD, Frith PA, Zwerink M, Monninkhof EM, van der Palen Job, Effing TW. Self-management interventions including action plans for exacerbations versus usual care in patients with chronic obstructive pulmonary disease. Cochr Database of System Rev. 2017; 8: 1-149.

12. Ogunbayo OJ, Russel S, Newham JJ, Heslop-Marshall K, Netts P, Hanratty B, Kaner E. Understanding the factors affecting self-management of COPD from the perspectives of healthcare practitioners: a qualitative study. Npj Prim Care Resp Med. 2017; 54: 1-9.

13. Bakhit M, Del Mar C, Gibson E, Hoffman T. Shared decision making and antibiotic benefit-harm conversations: an observational study of consultations between general practitioners and patients with acute respiratory infections. BMC Fam Pract. 2018;165 (19): 1-9.

14. McGee JS, Meraz R, Myers DR, Davie MR. Telehealth Services for persons with Chronic Lower Respiratory Disease and their Informal Caregivers in the Context of the COVID-19 Pandemic. Practice Innov. 2020; 5(2): 165-177.

15. Phillips JC, Lord RW, Davis SW, Burton AA, Kirk JK. Comparing Telehealth to Traditional Office Visits for Patient Management in the COVID-19 Pandemic: A cross-sectional study in a respiratory assessment clinic. J Telemed Telecare. 2021; 0(0): 1-8.

16. Brusco NK, Watts JJ. Empirical evidence of recall bias for primary healthcare visits. BMS Health Serv Research. 2015;24: 1351-1367

17. Seguin M, Hall L, Atherton H, Barnes R, Leydon G, Murray E, Pope C, Ziebland S, Stevenson FA. Protocol paper for the 'Harnessing resources from the internet to maximise outcomes from GP consultations (HaRI)' study: a mixed qualitative methods study. BMJ Open. 2018;8: e024188.

18. Kocaballi AB, Coiera E, Tong HL, White SJ, Quiroz JC, Rezazadegan F, Willcock S, Laranjo L. A network model of activities in primary care consultations. J Americal Medical Informatics Assoc. 2019;26(10): 1074-1082.

19. NVivo qualitative data analysis software; QSR International Pty Ltd. Version 12, 2018.

20. Lane J, David K, Ramarao J, Ward K, Raghuraman S, Waheed M, Lau AYS. Translating primary care to telehealth: analysis of in-person consultations on diabetes and cardiovascular disease. BJGP Open. 2023;7(1): 1-10.

21. Croymans D, Hurst I, Han M. Telehealth: The right care, at the right time, via the right medium. NEJM Catalyst Innov in Care Deliv. 2020 Dec 30;1(6).

22. United Kingdom - England (2017) Institute for Health Metrics and Evaluation. Available at: https://www.healthdata.org/united-kingdom-england (Accessed: April 22, 2023).

23. Fox, L, Heiden E, Chauhan MA, Longstaff JM, Balls L, De Vos R, Neville DM, Jones TL, Leung AW, Morrison L, Rupani H, Brown TP, Stores R, Chauhan AJ. Evaluation of telehealth support in an integrated respiratory clinic. Nat News. 2022;32(51)

24. Totten AM, Womack DM, Eden KB, McDonagh MS, Griffin JC, Grusing S, Hersh WR. Telehealth: Mapping the evidence for patient outcomes from systematic reviews. Nat Cent for Biotech Info. 2016

25. Davis, J. NeSmith A, Perkins R, Bailey J, Siracusa C, Chaudary N, Powers M, Sawicki GS, Solomon GM. Patient and family perceptions of telehealth as part of the cystic fibrosis care model during COVID-19. J of Cyst Fibrosis. 2020; 20(3). Available at: https://doi.org/10.1016/j.jcf.2021.03.009.

26. Althobiani M, Alqahtani JS, Hurst JR, Russell AM, Porter J. Telehealth for patients with interstitial lung diseases (ILD): Results of an international survey of clinicians. BMJ Open Resp Research. 2021;8(1).

27. Phimphasone-Brady P, Chiao J, Karamsetti L, SIeja A, Johnson R, Macke L, Lum H, Lee R, Farro S, Loeb D, Schifeling C, Huebschmann AG. Clinician and staff perspectives on potential disparities introduced by the rapid implementation of telehealth services during COVID-19: A mixed-methods analysis. Translat Behav Med. 2021;1-9.

28. NSW Health. Guide to undertaking virtual respiratory assessment for adults. 2020. Available at: https://www.health.nsw.gov.au/Infectious/covid-19/communities-of-practice/Documents/guide-virtual-resp-assessment.pdf.