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Potential Use of Telemedicine in Pediatrics: a single center retrospective review

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Running Head: THE EFFECTIVENESS OF TELEMEDICINE AS A DIAGNOSTIC AND
TREATMENT TOOL IN PEDIATRICS

Potential Use of Telemedicine in Pediatrics: a single center retrospective review

Zenaz Zarir Sarkari¹ and Corey Fish, MD²

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I. Abstract

Recent advancements and adoption of telemedicine have affected all aspects of healthcare including pediatrics. While telemedicine has the potential to increase access to pediatrics care, the limitations of this service in its current iteration bring into question its usefulness for direct replacement of in person care. This retrospective review demonstrates that only a small percentage of in person visits to our practice would have resulted in definitive diagnosis and treatment if facilitated via telemedicine. There is a need for better data collection techniques and tools suitable for remote care implementation before telemedicine becomes a useful diagnostic and treatment tool.

II. Introduction

During the COVID-19 pandemic, telemedicine saw over a 600% increase in usage as the healthcare industry transitioned away from in person care.^{1,2,3} Outside of a pandemic setting, telemedicine, particularly in the pediatric space, also has the potential to provide broader reach and access particularly in areas without these resources.⁴

However, telemedicine does come with several drawbacks, not least of which is that the healthcare system in the United States is largely based on in person interactions.² Additionally, quality telemedicine encounters are based on access to costly and non-widely distributed technologies, which tends to favor those with privilege.⁵ While some studies have shown pediatric telemedicine encounters lead to safe and

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3 appropriate care,⁶ there is no data on whether pediatric telemedicine can replace an in
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5 person visit.
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10 Our hypothesis is that telemedicine is likely ineffective in terms of definitive
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12 diagnosis and treatment and that most pediatric concerns require in person treatment.
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17 In order to evaluate the effectiveness of telemedicine in pediatrics, we retrospectively
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19 reviewed 2,019 visits to our pediatric primary and urgent care clinic in Portland, OR
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21 pre the SARS COV-2 pandemic from 2019 and early 2020.
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26 **III. Methods**

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28 A retrospective chart review was conducted for all in person visits at our pediatric
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30 primary and urgent care office located in Portland, Oregon. The current study
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32 includes four months leading up to the start of the COVID-19 pandemic (November,
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34 2019-February 2020). Each patient visit (n=2019) was first categorized into groups
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36 deemed automatically incompatible with telemedicine such as need for a procedure or
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38 additional workup.
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45 The remainder of the visits were reviewed by an experienced pediatric clinician and
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47 divided, based on the available documentation in the note, into whether definitive
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49 treatment via telemedicine was likely of value, potentially of value, or not of value.
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51 IRB approval was obtained through Pearl IRB.
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IV. Results

Our study included 1567 distinct patients representing 2019 visits. The majority of patients (n=63.15%) were under five years of age.

Telemedicine would not have been found to be of value for 1,350 visits (n=66.86%). Telemedicine would have been potentially of value for 578 visits (n=28.62%) and would likely have been of value in 91 visits (n=4.51%). The diagnoses most likely to have been definitively treated with telemedicine are rashes and Head/Eye/Ear/Nose/Throat/Mouth (HEENTM) concerns (Table 1).

Table 1

	Telemedicine Likely of Value	Telemedicine Potentially of Value	Telemedicine Not of Value	Total
Additional Workup Needed	0	0	586	586
Behavior Change	0	18	9	27
Cold/Respiratory Symptoms	3	172	236	411
Fever	2	91	40	133
Gastrointestinal/Genitourinary Concern	0	56	53	109
Head/Eye/Ear/Nose/Throat/Mouth (HEENTM) Concern	43	156	66	265
Injury	3	25	76	104
Other	2	3	22	27
Procedure	0	3	232	235
Rash	38	54	30	122
Total	91	578	1,350	2,019

V. Discussion

Our findings support our hypothesis that the majority of pediatric patients who visited our practice during the study period would not have been able to be definitively

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3 diagnosed and treated via telemedicine. Rather, telemedicine is of most value as an
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5 augmented triage tool.
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10 Given the recent telemedicine boom that has sprung up around the COVID-19
11 pandemic, it is clear that a significant portion of the proliferation energy in
12 telemedicine solutions could be better utilized perfecting remote data gathering tools.
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14 We would expect that a substantially higher portion of our visits could have been
15 definitively treated with telemedicine if some basic exam and laboratory data could
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17 be obtained at home.
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26 There are several limitations of our study. Selection bias by retrospectively analyzing
27 in person visits is one such limitation. In addition, despite analysis by expert pediatric
28 clinicians, there is some subjectivity to judging whether a patient might or might not
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30 have been definitively treated via telemedicine. Finally, due to its retrospective
31 nature, our study cannot comment on whether the patients who were deemed to need
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33 in person treatment would have been fine without a visit and vice versa.. More data
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35 and development in this area is needed before telemedicine can be utilized to its full
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37 potential.
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47 **VI. Acknowledgements**

48
49 The authors would like to thank Maryam Taheri for her support in gathering the
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51 research team, Ash Pine and Jason van Reken for their contributions to the data
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VIII. Competing Interests

Both authors have no competing interests to declare.

IX. References

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Supplement 1: Data Validation

To validate the accuracy of category assignment, a random sample of 200 patient visits sorted into the automatic telemedicine exclusion categories was analyzed by an experienced pediatric clinician in a blinded fashion. Further, to validate the accuracy of categorization of the remaining visits above into the telemedicine likely of value, telemedicine potentially of value, and telemedicine not of value, a separate random sample of 200 patient visits was analyzed in a blinded fashion by a second experienced pediatric clinician. Interrater reliability was found to be 97.5% for the automatic telemedicine exclusion criteria. This includes five visits that were mistakenly misclassified into the automatic exclusion groups. However, all five would have been placed into a group where an office visit would have been necessary for definitive treatment. Interrater reliability was 41.5% for the remaining patient visits when looking at exact matches across telemedicine likely of value, telemedicine potentially of value, and telemedicine not of value. However, there was 92% agreement when telemedicine not of value and telemedicine potentially of value were combined.

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I. Abstract

Recent advancements and adoption of telemedicine have affected all aspects of healthcare including pediatrics. While telemedicine has the potential to increase access to pediatrics care, the limitations of this service in its current iteration bring into question its usefulness for direct replacement of in person care, particularly in an acute or urgent care setting. This retrospective review demonstrates that only a small percentage of in person visits to our practice would have resulted in definitive diagnosis and treatment if facilitated via telemedicine. There is a need for better and more widespread data collection techniques and tools suitable for pediatric remote care implementation before telemedicine becomes a useful diagnostic and treatment tool in an acute or urgent care setting.

II. Introduction

During the COVID-19 pandemic, telemedicine saw over a 600% increase in usage as the healthcare industry transitioned away from in person care.[1,2,3] Outside of a pandemic setting, telemedicine, particularly in the pediatric space, also has the potential to provide broader reach and access particularly in areas without these resources.[4]

Additionally, telemedicine has shown equal efficacy compared to in person visits in certain cases as demonstrated by a recent systematic review.[5] It is important to note however, that this systematic review examined conditions that do not rely heavily on objective data collection such as mental health evaluations or chronic condition

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3 management where an in person visit would have been a part of the management
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5 plan. For the acute conditions included in the analysis, data collection tools such as
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7 cameras or cellular device otoscope attachment were part of the study design.
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11 Telemedicine also comes with several drawbacks, not least of which is that healthcare
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13 systems are largely based on in person interactions.[2] Additionally, quality
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15 telemedicine encounters are based on access to costly and non-widely distributed
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17 technologies, which tends to favor those with privilege.[6]
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21 Our hypothesis is that telemedicine is likely ineffective in terms of definitive
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23 diagnosis and treatment in the acute and urgent care setting and that in the absence of
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25 data collection tools, most of the visits presenting to our clinic could not be
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27 definitively managed via telemedicine alone.
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34 In order to evaluate the effectiveness of telemedicine in the acute and urgent care
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36 setting, we retrospectively reviewed 2,019 visits to our pediatric primary and urgent
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38 care clinic in Portland, OR pre the SARS COV-2 pandemic from 2019 and early
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40 2020. Our clinic provides routine and urgent (non-emergent) care to pediatric patients
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42 age 0-21 years of age. As the majority of our practice is acute care, telemedicine at
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44 our practice is almost entirely utilized to address new acute concerns or injuries.
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50 51 **III. Methods** 52 53 54 55 56 57 58 59 60

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3 A retrospective chart review was conducted for all in person visits at our pediatric
4 primary and urgent care office located in Portland, Oregon. The current study
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6 includes four months leading up to the start of the COVID-19 pandemic (November,
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8 2019-February 2020). Each patient visit (n=2019) was first categorized into groups
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10 deemed automatically incompatible with telemedicine such as need for a procedure or
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12 additional workup. Due to the hours of operation and lack of a pre-existing
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14 relationship with our patients, sending them to an outside center for blood work or
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16 imaging is not practical.
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24 The remainder of the visits were reviewed by an experienced pediatric clinician and
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26 divided, based on the available documentation in the note, into whether definitive
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28 treatment via telemedicine was likely of value, potentially of value, or not of value.
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31 IRB approval was obtained through Pearl IRB.
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35 **IV. Results**

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37 Our study included 1567 distinct patients representing 2019 visits. The majority of
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39 patients (n=63.15%) were under five years of age.
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45 Telemedicine would not have led to definitive diagnosis and treatment for 1,350 visits
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47 (n=66.86%). Telemedicine would have been potentially useful for definitive
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49 diagnosis and treatment for 578 visits (n=28.62%) and would likely have been useful
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51 for definitive diagnosis and treatment in 91 visits (n=4.51%). The diagnoses most
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likely to have been definitively treated with telemedicine are rashes and Head/Eye/Ear/Nose/Throat/Mouth (HEENTM) concerns (Table 1).

	Telemedicine Likely of Value	Telemedicine Potentially of Value	Telemedicine Not of Value	Total
Cold/Respiratory Symptoms	3	172	236	411
Head/Eye/Ear/Nose/Throat/Mouth (HEENTM) Concern	43	156	66	265
Fever	2	91	40	133
Gastrointestinal/Genitourinary Concern	0	56	53	109
Rash	38	54	30	122
Injury	3	25	76	104
Behavior Change	0	18	9	27
Procedure	0	3	232	235
Other	2	3	22	27
Additional Workup Needed	0	0	586	586
Total	91	578	1,350	2,019

Table 1

V. Discussion

Our findings support our hypothesis that the majority of pediatric patients who visited our practice during the study period could not have been treated definitively via telemedicine. Rather, telemedicine is of most utility as an augmented triage tool.

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3 Given the recent telemedicine boom that has sprung up around the COVID-19
4 pandemic, it is clear that a significant portion of the proliferation energy in
5 telemedicine solutions could be better utilized perfecting remote data gathering tools
6 geared specifically towards pediatric patients. We would expect that a substantially
7 higher portion of our visits could have been definitively diagnosed and treated with
8 telemedicine if some basic exam and laboratory data could be obtained at home.
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19 There are several limitations of our study. Selection bias by retrospectively analyzing
20 in person visits is one such limitation. In addition, despite analysis by expert pediatric
21 clinicians, there is some subjectivity to judging whether a patient might or might not
22 have been definitively diagnosed and treated via telemedicine. Another limitation is
23 that our clinic almost entirely caters to acute and urgent illnesses and concerns. It's
24 likely that due to the nature of the presenting complaints, telemedicine alone would
25 not be sufficient for diagnosis and treatment without additional patient data. Finally,
26 due to its retrospective nature, our study cannot comment on whether the patients who
27 were deemed to need in person treatment would have been fine without a visit and
28 vice versa.
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45 **VI. Acknowledgements**

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47 The authors would like to thank Maryam Taheri for her support in gathering the
48 research team, Ash Pine and Jason van Reken for their contributions to the data
49 collection and analysis, Juli Moore of Oregon State University for advisory support,
50 and Anamara Ritt of the University of Southern California for advisory support.
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