RACS Advocacy - Review of Telehealth Services in Australia

A rapid review commissioned by RACS

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Final Report

Title	Review of Telehealth Services in Australia
Author / Affiliation	Sarah Smith, Royal Australasian College of Surgeons Dr Jon Henry Jacobsen, Royal Australasian College of Surgeons Dr David Tivey, Royal Australasian College of Surgeons Associate Professor Wendy Babidge, Royal Australasian College of Surgeons
Telehealth Working Group	Professor Mark Frydenberg Professor Guy Maddern Dr Bridget Clancy Dr Christine O'Neill Mr John North Dr Erica Jacobson Dr Roxanne Wu Mr Patrick Reeder Mr Chesney O'Donnell

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Abbreviations

COVID-19	Coronavirus disease 2019
HCP	Health care practitioner
MBS	Medicare Benefits Schedule
NR	Not reported
RACS	Royal Australasian College of Surgeons
RCT	Randomised Control Trial

Suggested Recommendations from the Telehealth Working Group

The Telehealth Working Group recommends the Royal Australasian College of Surgeons (RACS) advocate for the continued listing of specialist telehealth items on the Medicare Benefits Schedule (MBS) past the current review date of 31 March 2021.

1. Summary

- In response to the COVID-19 global pandemic, the Australian Government introduced temporary telehealth MBS items to ensure safe access to healthcare.
- RACS commissioned this report to investigate patient and provider satisfaction toward telehealth services, and barriers and facilitators to its implementation.
- Patients and providers were found to be satisfied with telehealth services due to time- and cost-savings, and improved access to specialty care.
- Key barriers to the implementation of telehealth services include initial investment cost, technical issues and privacy concerns.
- Telehealth is facilitated by appropriate training and support for technology users, and results in an overall reduction in healthcare resource usage.
- Telehealth accounted for 14% of specialist consultations from March to September 2020. Telephone was the preferred telehealth medium, accounting for 80% of interactions.

2. Introduction

Telehealth, using videoconference or telephone, was first introduced in Australia to improve patient access to primary healthcare resources in rural and remote settings.[1, 2] It has consistently shown positive outcomes for both patients and providers, with reduced hospital stays, reduced travel burden, efficient networking between specialists and improved healthcare access.[3] Telehealth in surgery is a relatively new service with increasing utilisation. In general, telehealth in surgery is used for preoperative evaluation, postoperative care and ongoing medical management.[4] Studies evaluating telehealth in surgery observed comparable safety and effectiveness to standard care (face-to-face consultations)[5, 6], however the available evidence is weak and of low quality.[7] Of note, the majority of systematic reviews in this report were of high or medium quality.

In Australia, telehealth services were introduced to the MBS in 2011 (MBS item 99 for specialists), with access by videoconference only and initially limited to individuals in remote or rural settings, those in residential care and patients engaging with an Aboriginal medical service.[8] On 13 March 2020, in response to the COVID-19 pandemic, the Australian Government introduced new temporary MBS items to assist with social distancing and promote community safety.[9] These new telehealth items have unrestricted geographical location and attendance can be via telephone when videoconferencing is unavailable.[9] Only real-time synchronous technologies (e.g. videoconference or telephone) are eligible for MBS reimbursement. Asynchronous telehealth interactions (those which do not occur at the same time e.g. store and forward) are ineligible for MBS reimbursement. These temporary MBS items are due for review on 31 March 2021 and it is unclear whether they will remain available to clinicians after this date.

Currently, telehealth is not being used to its full potential in Australia.[1] Given the potential for healthcare savings with equivalent safety outcomes[5] and increased health equity[10], it is important that barriers to the implementation and use of telehealth services are investigated.[1, 11, 12] RACS has commissioned this report to investigate the factors that either prohibit or encourage the implementation and use of telehealth, and to examine patient and provider perceptions of telehealth services. Utilisation of the new MBS telehealth items (91822, 91823, 91832 and 91833) was also explored. The results of this review provide additional evidence to support the results of a RACS commissioned patient/provider survey and are used to inform RACS policy.

3. Objectives

This rapid review evaluates patient and provider perceptions of telehealth services and investigates barriers to implementing these services, with a particular focus on surgery. The potential impact to MBS telehealth items is also highlighted.

4. Research methods

A rapid review methodology was employed for the assessment of telehealth services. The rapid review is a flexible methodology tailored to the specific research question to be addressed in a limited time frame. This is achieved by limiting one or more domains of a traditional comprehensive systematic review.[13]

For this rapid review, a systematic search of a single biomedical database—PubMed—was performed on 15 July 2020 (with searches updated on 16 September 2020). A combination of search terms and Medical Subject Headings (MeSH) relating to the PICO criteria (***Table 1***) were used (***Appendix A***). The search terms were combined with validated methodological search filters to restrict articles identified to systematic reviews.[14]

The search was limited to studies published after 2015 to provide contemporary relevance. Many technology barriers reported before 2015 have now largely been overcome (e.g. internet access and bandwidth).

A working group of expert clinicians and policy officers was consulted at key points in the process to ensure clinical relevance. The response of the Working Group is collated narratively in ***Section 6****: Limitations identified by the Telehealth Working Group***.**

Table 1 PICO criteria for rapid review search

Population	Patients, medical practitioners [a]
Intervention	Telehealth: telephone consultation and/or videoconferencing
Comparator	Standard care: in person consultations
Outcomes	Patient and provider satisfaction Time- and cost-savings Barriers to access
Study designs	Systematic reviews and meta-analyses

Notes

a = medical practitioner includes general practitioner, specialist, consultant physician, psychiatrist, paediatrician, geriatrician, neurologist, radiologist, cardiologist, public health physician, anaesthetist, cardiothoracic surgeon, general surgeon, neurosurgeon, orthopaedic surgeon, otolaryngology head and neck surgeon, paediatric surgeon, plastic and reconstructive surgeon, urological surgeon or vascular surgeon.

4.1. Inclusion criteria

The technologies used for telehealth services are heterogeneous and often poorly defined. To maintain focus on services that align with the MBS item numbers and their impact on the field of surgery, studies which had an emphasis on live, interactive, synchronous technologies (videoconference or telephone) were included in this review. Studies using a combination of synchronous and asynchronous technologies were included where appropriate.

4.2. Exclusion criteria

Studies were excluded if they:

- had a specific focus on mental health
- had a specific focus on asynchronous telehealth modalities only (e.g. wearable devices, apps, internet-delivered education) without an interactive consultation
- were published prior to 2015
- were published in a language other than English.

4.3. Study selection

Studies were selected using the predefined PICO criteria (***Table 1***). Titles and abstracts for all studies were reviewed by two authors. One author reviewed each full-text article for inclusion, with a second author reviewing a random sample. Disagreements were resolved through consensus.

4.4. Data extraction

Data was extracted into a table by one author and a second author checked the results. Data extracted from articles included author, year, study design, setting, population characteristics, intervention type and frequency, and outcomes (patient/provider satisfaction, barriers, facilitators, healthcare utilisation).

5. Results

The search returned a total of 1,807 articles. After screening titles and abstracts, 1,659 articles were removed, leaving 148 full-text articles for review. These were screened using the predefined inclusion and exclusion criteria, leaving a total of 24 studies for final review.

5.1. Characteristics of included studies

A summary of the study characteristics is provided in ***Appendix B***. Of the 24 unique telehealth studies, 22 were systematic reviews and 2 were meta-analyses. The included studies were in the fields of surgery[4,15,16,17,18,19,20,21], dermatology[22], neurology[23,24], infectious disease[25], general practice[26,27,28], oncology[29,30], orthopaedics musculoskeletal[31,32,33], palliative care[34], endocrinology[35] and mixed specialty fields.[36,37] The majority of studies involved trials from the USA (k = 14), Canada (k = 9), the UK (k = 9) and Australia (k = 6).

Interventions in the studies varied, with 13 studies using synchronous modalities (videoconferencing and/or telephone) and 11 using both asynchronous and synchronous technologies. Asynchronous

technologies included email, text messaging, store and forward, wireless monitoring devices, digital camera, smartphone apps, image-sharing systems, wearable devices and automated telephone calls.

Telehealth was administered by a broad range of healthcare providers such as clinicians and other healthcare professionals (e.g. nurse practitioners, physiotherapists and diabetes educators). The intervention was used for clinical care, diagnosis, rehabilitation/physiotherapy, education, provider-to-provider consultation and counselling. The intervention was provided in the home, hospital or remote clinic, with two studies specifically focusing on rural or remote populations.

Length of time for the intervention and follow-up duration was not always clearly defined. Studies that reported frequency of intervention ranged from a single interaction to regular appointments three times per week. Follow-up times were up to 13 months, with an average of 7 months. Appointment duration ranged from 10 minutes to an hour.

Patient satisfaction was the most frequently reported outcome (k = 22). Seven studies reported provider satisfaction. Other reported outcomes included barriers to implementation (k = 6) and healthcare utilisation (k = 6).

Of the eight articles pertaining to the field of surgery, all used live interactive videoconferencing technology and all studies also included asynchronous modalities. These modalities included using digital cameras for examination of airways and postoperative wound management and use of websites as educational tools to inform patients about upcoming surgery or for physiotherapy. Irrespective of the modality, telehealth was used for preoperative assessment, preanaesthetic evaluation, routine follow-up, wound and symptom monitoring, and physical rehabilitation.

5.2. Applicability of evidence base to surgery in Australia

Applicability refers to whether the findings of a review can be applied to a particular setting or population, taking into consideration the feasibility of implementing the intervention, the population characteristics and the context.[38] For this review, the applicability of the findings to interactive telehealth modalities in the field of surgery in Australia is discussed.

An overview of demographic and intervention characteristics related to telehealth service provision in surgery in Australia is provided in ***Table 2***.

Table 2 Australian demographic information associated with telehealth services and surgery

Parameter	Characteristics
Demographic	Surgery patients and their caregivers Tertiary healthcare focused in metropolitan cities with populations in rural or remote locations[1]
Intervention characteristics	Interactive videoconference or telephone call [a] No geographical restrictions [b]
Reason for intervention	Preoperative assessment (education, preanaesthetic evaluation) Postoperative care and follow-up (wound assessment, symptom monitoring) Physiotherapy
Funding model	Publicly funded reimbursement model MBS

Notes:
a = For Medicare reimbursement a visual or audio link must be made with the patient.[39]
b = There are no geographical restrictions on the MBS items.[39]

In Australia, to be eligible for MBS payment the telehealth provider must establish and maintain an audio or audio visual link with the patient, limiting the telehealth modalities to videoconferencing and telephone.[39] All of the 24 included studies explored telehealth modalities consistent with MBS eligibility requirements (i.e. videoconferencing or telephone), with 11 of them including the use of additional asynchronous technologies. The eight studies that specifically investigated the field of surgery all included both interactive technology and asynchronous technology. Applicability of the study findings to the Australian context is appropriate due to the use of interactive technologies in all articles. Care has been taken to draw data from interactive telehealth interactions where it is clearly defined.

Reasons cited in the studies for telehealth interventions in the surgical setting were preoperative assessment (e.g. preanesthetic evaluation), postoperative routine care (e.g. symptom and wound monitoring) and physiotherapy. Telehealth is successfully used in surgery in Australia for these interactions.[1]

5.3. Quality of evidence

A quality appraisal of systematic reviews based on the AMSTAR 2[40] measurement tool to assess systematic reviews is provided in ***Appendix C***. Quality evaluation was performed by one author, with a second author reviewing a random sample.

Sixteen studies scored a high rating, seven were of medium quality and one study was low quality.

A comprehensive literature search was outlined in 23 of the 24 studies. The PICO criteria were explicitly outlined in 23 of the 24 studies. A high level of detail in the PICO domains allowed an appropriate comparison between the demographics of the included studies and the Australian context. Risk-of-bias assessment was considered adequate in 18 of the 24 studies. Only two articles included a meta-analysis.[18, 21] These reports used a suitable method for statistical combination of results and investigated publication bias appropriately.

5.4. Patient perception of telehealth

A total of 22 articles reported patient satisfaction. The studies included in the reviews used a variety of methods to measure patient satisfaction, including semi-structured interviews, validated satisfaction questionnaires and study-specific questionaries using a five- to seven-point Likert scale. ***Table 3*** details a summary of the drivers of patient satisfaction explored in the reviews.

Overall, patients were satisfied or very satisfied with telehealth and found it equivalent or superior to standard care. Drivers of patient satisfaction included time- and cost-savings due to reduced travel and waiting times[16, 22, 28-31, 33, 34, 36], reduced need for childcare and less time away from work[4, 15, 22, 24, 29, 31, 33-35, 37], and clinician punctuality.[22, 31] A pilot study within one review found savings of $431 per patient for videoconference telehealth compared to standard care ($35 telehealth vs $466 standard care), due to travel cost savings and less time away from work.[41]

Improved access to healthcare was a recurring theme within patient satisfaction. Improved access via telehealth was discussed in relation to addressing disparities in healthcare access, especially for rural patients or those housebound.[19, 24, 34, 35] One study identified that telehealth offered specialist healthcare access to patients who would otherwise be unable to attend appointments due to associated travel costs.[34] These findings apply to the Australian context due to the centralisation of tertiary care to the major cities with limited specialist services available to smaller rural populations.[1]

Quality of patient care is a measure of healthcare success.[42] Patient perception of the quality of care was discussed in multiple studies and was described as a 'positive personal experience' and 'patient-centred care'. Of the studies that investigated quality of care as an outcome, all reported that patients had a positive perception of the quality of care.[30, 36, 37] Patients reported that they could build a good rapport with their healthcare provider during telehealth consultations[28, 30, 31, 35, 37], and that providers exhibited similar levels of empathy.[29, 36] Patients' perceptions of clinician competence or skill was equivalent for telehealth compared with face-to-face consults.[28] Crucially, there was no difference in the self-management of conditions[37], with two studies demonstrating telehealth offered improvement in self-management.[36,37]

Table 3 Drivers of patient satisfaction identified in the included studies

Drivers of Satisfaction	Andrees (2020)[22]	Asiri (2018)[4]	Downes (2017)[26]	Fournier (2018)[29]	Gilbert (2018)[31]	Grona (2018)[32]	Gunter (2016)[15]	Haider (2020)[33]	Jess (2019)[34]	Liptrott (2017)[30]	McLendon (2017)[35]	Melian (2020)[21]	Orlando (2019)[36]	Schoen (2019)[16]	Thiyagarajan (2020)[28]	Vyas (2017)[19]	Yeroushalmi (2019)[24]	Zandbelt (2016)[37]
Time savings	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+			+
Cost savings		+		+	+	+	+		+		+	+	+	+	+		+	+
Less time off work		+					+	+			+							+
Improved access									+	+	+				+	+	+	

5.5. Provider perception of telehealth

Providers were reported to be positive about telehealth, with a high satisfaction rating, but there was limited exploration of the reasons for this satisfaction compared with the studies of patient satisfaction. Some cited reasons included shorter consultation times[22, 33, 43], suitable ability to take patient histories[33], ability to make clinical decisions[28] and potential for reduced workload.[27] Triage and advice delivered by nurses over the telephone contributed to a reduction in clinician workload rather than a reduction in face-to-face appointments.[27]

Four studies in the field of surgery all stated that providers expressed satisfaction with telehealth.[15, 16, 21] One study reported that telehealth for preanaesthetic evaluations was 'not only as reliable as traditional in-person methods but also provided the pertinent information needed to develop a safe anaesthesia plan'.[16]

None of the included reviews reported on provider or patient preference for videoconference or telephone interactions.

5.6. Barriers and facilitators to implementing telehealth

Multiple studies revealed that clinicians were concerned with telehealth consultations when a physical examination of the patient was needed; face-to-face consultation was preferred in this situation.[16, 22, 31, 37] This was particularly relevant when palpation was required, possibly resulting in more follow-up tests being requested by the provider.[37] One study focusing on neurosurgery found telehealth was successful in 99.6% of patients. Of the failures, 81.5% were attributed to technology issues and 18.5% required face-to-face appointments. Nevertheless, telehealth was successful in determining which patients required a face-to-face appointment.[20]

Various aspects of surgical care may be more suited to telehealth. For example, videoconference was acceptable when physiotherapists were required to monitor physical assessment or performance after knee arthroplasty.[31] Another study noted it was possible to 'perform a near-full neurological exam remotely via telemedicine'.[20]

The technology used for telehealth can be both a barrier and a facilitator. One review found that without appropriate training and support for providers, the use of technology can be a barrier.[34] Technical issues such as internet problems resulted in time lag and hindered fluidity in consultations, resulting in incomplete communication.[34] However, the studies within this review were conducted pre-2010 and internet services and technology have advanced and become more ubiquitous since then. These issues may not present a barrier today. Studies found that the system should be simple and easy to use from the provider's perspective.[19, 34] The cost of implementing the technology required for telehealth was mentioned as a barrier[19], however, McLendon[35] suggests that these costs relate to initially setting up the practice for telehealth and should be considered a one-off cost. It was noted that some business versions of video software (e.g. Skype) require a subscription, which can result in ongoing costs to the practice. The introduction of audio-only telehealth MBS item numbers may dispel implementation cost as a barrier to service provision in Australia.

Studies reported security concerns such as breaches of patients' confidential health records and cyber threats.[34, 36] Privacy was reported as a concern for patients, suggesting it can be challenging to find an appropriate place to conduct a videoconference, making them reluctant to share private information.[28, 34] However, one study found that some patients appreciated the anonymity telehealth provides, allowing them to discuss issues too difficult to confront face-to-face.[36]

Multiple studies demonstrated that telehealth could reduce the use of healthcare resources. One review investigating acute infectious diseases found the telehealth group had an average stay 3.4 days shorter than the standard care group (k = 4).[44] Another review found no significant difference in length of hospital stay.[17] Cost savings to clinical practice of $150 per patient were observed when genetic counselling was offered by telephone, rather than in person.[29] Savings were attributed to reduced staff travel and time, office space requirements and overheads. Gunter[15] described a pilot study that enabled an additional 110 in-clinic appointments over 10 months by conducting postoperative follow-up appointments by telephone rather than in-clinic.

5.7. Safety and clinical utility

Safety outcomes of telehealth services are not an explicit outcome for this rapid review. While not specifically searching for safety outcomes in the included studies, we interrogated the included articles to highlight any obvious safety issues.

Patient range of movement and the ability of the provider to assess this were found to be equivalent in telehealth and face-to-face visits.[21, 33]

One systematic review (k = 7) of patients who received postoperative care by telehealth found the clinical outcome to be equivalent to standard care.[15] The authors concluded the safety of postoperative care by telehealth is encouraging. A study investigating telehealth for preanaesthetic evaluation found it to be accurate and successful.[16] These studies used interactive telephone or videoconferencing technologies.

One review (k = 13) in the field of dermatology reported comparable diagnostic agreement[22], and another found that telehealth was reasonably safe for primary care triage.[27] For postoperative patients, no difference was found in emergency department visits or hospital readmissions between the intervention and control groups.[17] One study used videoconferencing to assess traumatic wounds in the emergency department and found videoconference evaluation correlated with bedside evaluation (n = 173).[45]

5.8. Utilisation of telehealth in Australia – MBS item statistics

Publicly available data was accessed from the Medicare Australia Statistics website[46] to investigate usage of and trends in specialist telehealth activity.

Specialist MBS item usage from January to September shows a similar monthly trend for the years 2015 to 2020 (***Figure 1***). Over this period, consultations in the month of January were lower compared to February and March, with another consistent decline in April. New telehealth items were introduced on 13 March 2020, meaning from 20 April 2020 specialists were no longer required to bulk bill these items. April 2020 data shows a decline in total consultations (i.e. telehealth and face-to-face) compared to previous years, however, while there was an overall drop in MBS claims, consultations via telehealth increased to 30% of total specialist consultations (***Figure 2***). Since April 2020, total consultations have slowly increased, such that by June 2020 total consultations were at similar levels to previous years. The proportion of telehealth usage fell in both May (20%) and June of 2020 (12%) (data not shown).

This data indicates that the introduction of telehealth MBS items on 13 March 2020 resulted in an increase in telehealth usage by specialists, but the majority of claims were still face-to-face. The total number of specialist consultations did not increase after the introduction of these telehealth items. The greatest uptake of telehealth was in April 2020 and has declined since then. On average, telephone was the preferred telehealth modality, accounting for 80% of claims. In comparison to specialists, general practitioners used the telephone for approximately 97% of telehealth consultations ***(Figure 3***). It is unclear from the MBS data whether the preference for the telephone modality is patient or provider driven.

Figure 1 Surgical specialist MBS item usage 2015–2020 (January–September)

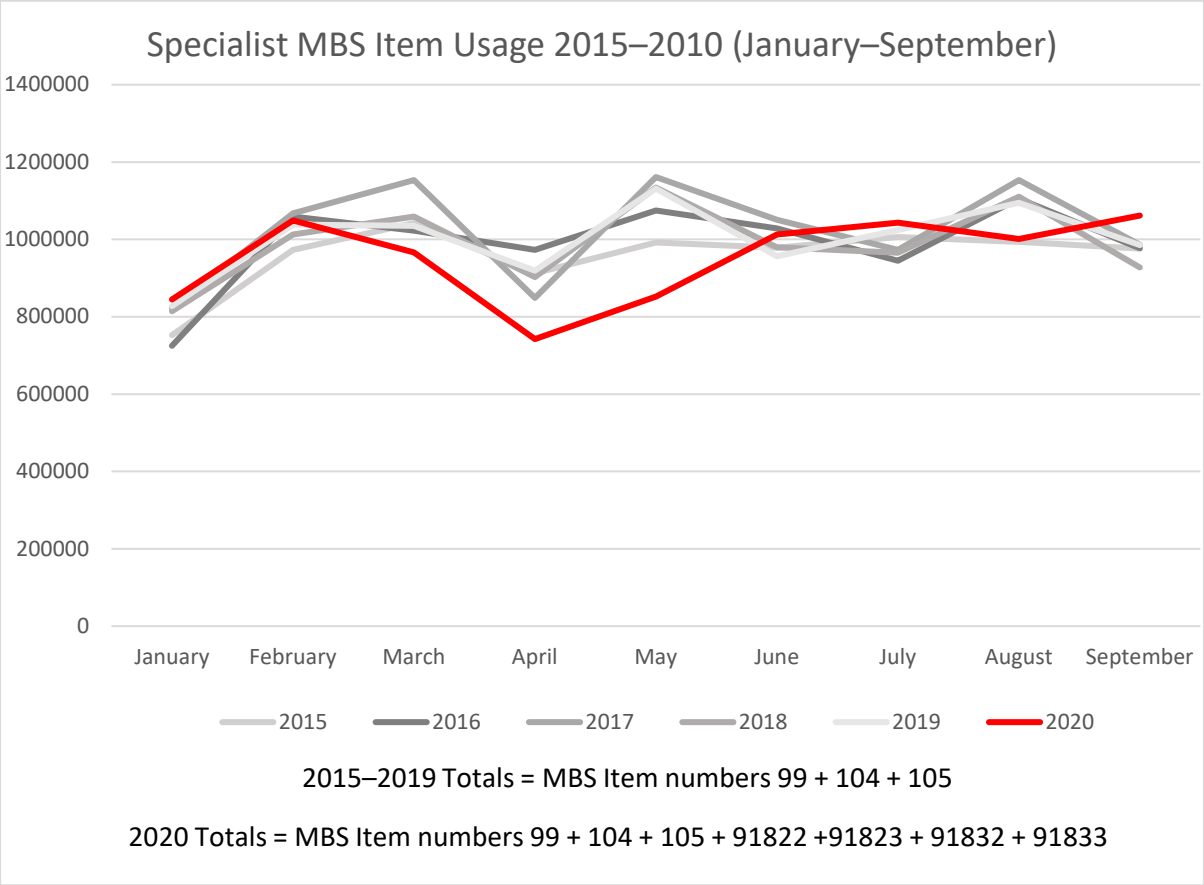


Figure 2 Surgical specialist MBS item usage 2020 (January–September)

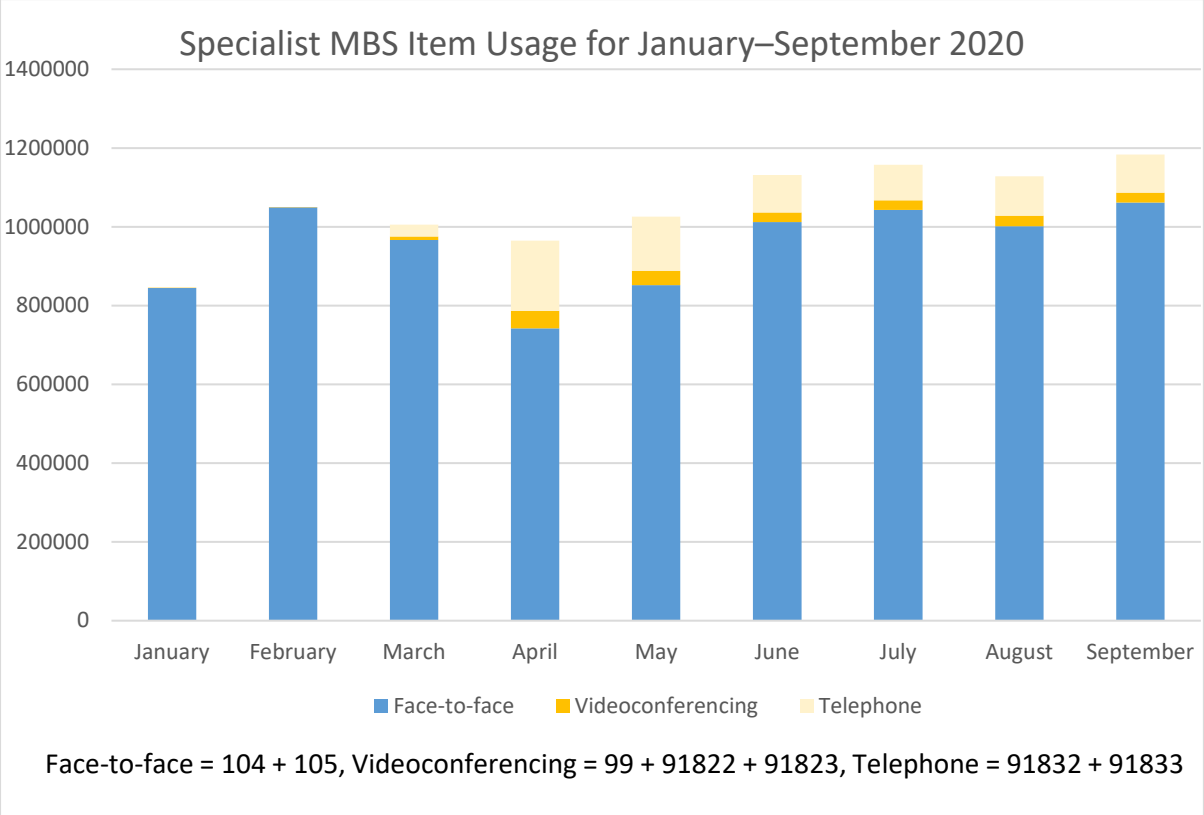
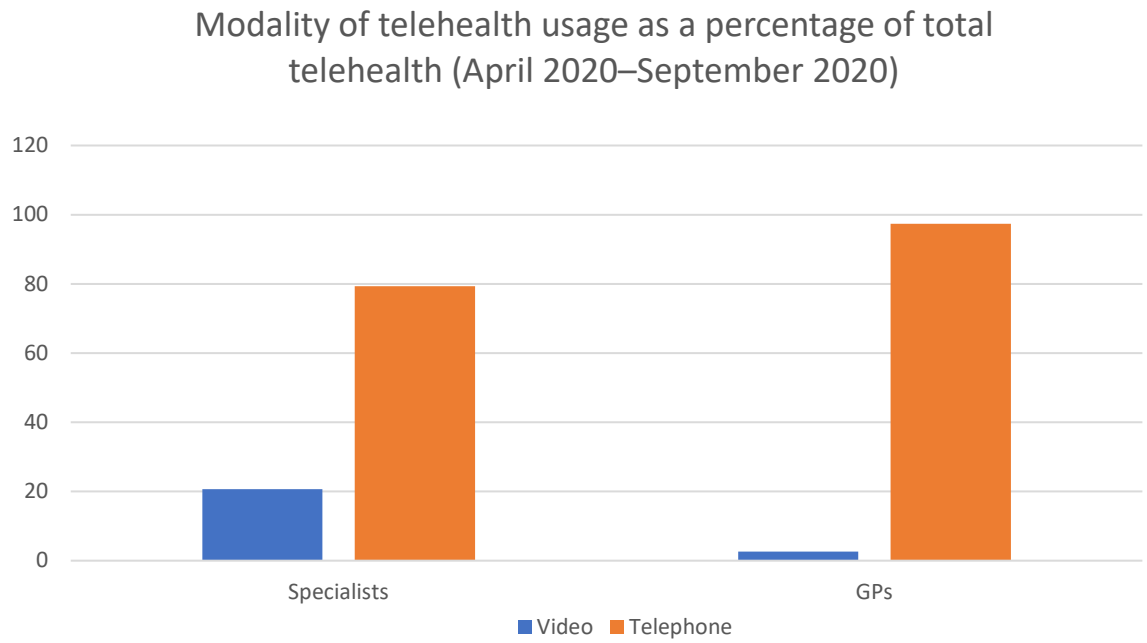


Figure 3 Telehealth modality usage



GPs: Videoconference = 2461, 2463, 2464, 2465, 91790, 91800, 91801, 91802; Telephone = 91795, 91809, 91810, 91811
Specialists: Videoconference = 99, 91822, 91823; Telephone = 91832, 91833

6. Limitations identified by the Telehealth Working Group

This literature review was supported by an expert clinical working group that provided relevant insight into the provision of telehealth services in practice.

The current COVID-19 pandemic has forced many healthcare services to quickly implement and adopt telehealth services within their practice. This rapid uptake has resulted in staff who are not fully trained to use telehealth, and the implementation of software that may not have been appropriately assessed to ensure it is fit for purpose. Healthcare services must be given adequate time and funding to implement telehealth services safely and thoroughly before the service can reach its full potential. The ongoing cost of business versions of some video software packages can also present a barrier to some practices offering videoconferencing, especially those performing a low number of telehealth consultations. The working party also acknowledged that not all patients have access to a smartphone, which limits access to services, potentially driving choices toward telephone consultations over videoconferencing.

The suggestion that it is 'possible to perform a near-full neurological exam remotely via telemedicine'[20] was questioned by the working group. Members of the group felt that a neurological examination is not possible without an in-person physical examination of the patient. They agreed, however, that telehealth can be used successfully to determine whether the patient needs to attend for a face-to-face

consultation. The Working Group acknowledge that due to Medicare billing restrictions, telehealth services are explicitly not to be used for triage, however, an initial examination of the patient within a traditional telehealth appointment is appropriate. Further, qualitative results from a telehealth survey conducted by RACS suggest that surgeons are using telehealth in the appropriate clinical context. A more thorough physical examination of the patient may be possible if another healthcare professional is remotely located with the patient. However, because this mode of telehealth is not necessary to facilitate the new temporary MBS items discussed in this review, we have focused on telehealth services which do not require this service.

One working group member highlighted that many calls to patients go unanswered because the incoming caller identification (ID) is blocked, prompting many patients not to answer the call, and resulting in multiple call attempts, which wastes time. This could be overcome by installing a specific hospital caller ID.

7. Conclusion

This rapid review was commissioned to investigate patient and provider perception of telehealth—with a particular focus on the field of surgery—as well as barriers and facilitators to its widespread implementation. Surgery-specific literature was limited, so the results were largely informed by other specialties. The results are likely applicable to surgery, owing to the similar manner in which telehealth is conducted.

Overall, patients were satisfied with telehealth for delivery of healthcare. The key benefits were time- and cost-savings, with less travel time and time away from work reported but the same quality of care compared to standard care. Clinicians were also satisfied with telehealth, reporting shorter consultation times and the potential for increased efficiency. Significant barriers to the widespread implementation of telehealth include the inability to perform a physical examination, technology issues and patient privacy. No significant safety and clinical utility issues with telehealth were identified.

The introduction of telehealth item numbers with fewer restrictions has not increased total specialist claims. Telehealth consultations peaked in April 2020, but this coincided with the lowest number of specialist consultations overall. This low number of total consultations in April may be attributed to the beginning of COVID-19 restrictions in Australia. Telehealth usage as a percentage of total specialist consultations has continued to decline since April. For surgical specialist consults, telephone is the preferred modality, however, no studies addressed the reasons for this preference, or whether it is patient- or provider-driven. Possible reasons include the ongoing expense of video software subscriptions for providers, or that not all patients have access to a smartphone.

Telehealth offers the opportunity to provide equitable healthcare remotely, reducing travel costs and childcare needs for patients, while offering medical care as effective as standard care, keeping both patients and healthcare workers safe.

8. Appendices

Appendix A: Search terms applied to PubMed database 15 July 2020 (repeated 16 September 2020).

Table 4 Systematic search strategy used in PubMed

Number	Query	Results
1	telehealth	36,574
2	telemedicine	34,833
3	Telemedicine[Mesh]	26,650
4	videoconferenc*	3,072
5	telerehabilitat*	1,076
6	telepractice	122
7	teleconsult*	1,341
8	remote consultation	4,975
9	remote monitoring	2,194
10	“Virtual care”	340
11	telecare	3,348
12	1 OR 2 OR 3 OR 4 OR 5 OR 6 OR 7 OR 8 OR 9 OR 10 OR 11	40,398
13	12 AND systematic reviews[filter] AND 2015 date limit	1,699

Appendix B: Summary of findings

Table 5 Characteristics of included studies

Study	Medical field	Study design, objectives, number of studies	Intervention	Satisfaction	Facilitators	Barriers
Surgery						
Asiri (2018)	Surgery Initial consultation/ Ongoing care	Systematic review investigating use of telemedicine in surgical care k = 24 (RCTs, non-RCTs) n = NR	Videoconferencing, telephone, asynchronous technologies[a] Patient – provider Provider – provider	High patient satisfaction reported in 9/9 studies (score 4.5–5/5)	Time- and cost-savings - Avoiding unnecessary trips to hospital - Less time off work	NR
Eichberg (2020)	Neurosurgery	Systematic review investigating treatment of neurosurgical patients k = 52 (RCTs and non-RCTs) n = 2–25,366	Videoconference, asynchronous technologies[a] Patient – provider	NR	Improved access Ability to assess when patient requires face-to-face consult	Technology issues
Gunter (2016)	Surgery Postoperative care	Systematic review to examine how telemedicine is used to facilitate postoperative recovery after discharge k = 21 (RCTs, non-RCTs)	Videoconferencing, telephone, asynchronous technologies[a] Patient – provider	Patients reported being satisfied or very satisfied with telemedicine in 5/5 studies (99%; 4.8/5; 9.4/10)	Time- and cost-savings - Less time off work - Avoiding overnight accommodation - Less travel More clinic appointments available (1 study)	NR

Study	Medical field	Study design, objectives, number of studies	Intervention	Satisfaction	Facilitators	Barriers
		n = 3–346		Providers expressed satisfaction with telemedicine (2 studies)		
Melian (2020)	Orthopaedic Surgery	Systematic review and meta-analysis to evaluate patient and physician satisfaction with telemedicine compared to face-to-face consultation. k = 17 (RCTs and non-RCTs) n = 17–419	Videoconferencing, telephone interviews Patient – provider	Patients and physicians found telemedicine to be equivalent or superior to traditional visits	Time- and cost-savings - Shorter waiting times - Shorter consultation times - Less travel	NR
Schoen (2019)	Surgery Preanaesthetic evaluation	Systematic review to evaluate whether telehealth can be used effectively for surgical patients to perform or supplement preanaesthetic evaluation k = 7 (RCT, non-RCTs) n = 1–777	Videoconference, asynchronous technologies[a] Before surgery Single interaction Patient – provider Patient together with nurse/GP located remotely, anaesthetist located in hospital	Patients and anaesthesiologists satisfied or highly satisfied with telehealth consultation (1 study)	Time- and cost-savings - Less travel	Inability to perform physical examination

Study	Medical field	Study design, objectives, number of studies	Intervention	Satisfaction	Facilitators	Barriers
van der Meij (2016)	Surgery Ongoing care	Systematic review to evaluate effect of perioperative eHealth on postoperative care k = 27 (RCTs, non-RCTs) n = 22–379	Videoconference, eHealth (asynchronous[a]) Before surgery and daily up to 6 months Patient – provider	Patients felt telehealth was superior to standard care in 4/6 studies.	NR	NR
van Egmond (2018)	Post-surgery rehabilitation	Systematic review to investigate effectiveness of telerehabilitation in regard to functional outcomes and quality of life k = 23 (RCTs, non-RCTs) n = 22–410	Videoconference, telephone, asynchronous technologies[a] Sessions 10 min to 1hr Frequency once per day to once per month Lasting 3 days to 13 months Patient – provider	Patients reported very high satisfaction with telehealth (1/1 study)	NR	NR
Vyas (2017)	Surgery Dermatology	Updated systematic review investigating use of telemedicine in surgery and dermatology k = 89	Videoconference, asynchronous technologies[a] Patient – provider	NR	Improved access - Rural communities without a specialist Ease of use	Implementation costs

Study	Medical field	Study design, objectives, number of studies	Intervention	Satisfaction	Facilitators	Barriers
		n = 39–173	Provider – provider		Reduced use of healthcare resources	
Dermatology						
Andrees (2020)	Dermatology Diagnosis/ Ongoing care	Systematic review comparing live interactive teledermatology with face-to-face care k = 23 (RCTs, non-RCTs) n = 11–475	Live interactive videoconference Patient – provider	Patients and providers satisfied compared to standard care (5/5 studies, >60% agreement, author's definition)	Time savings - Less travel time - Shorter waiting times - Shorter consultations Fewer referrals	Inability to perform physical examination
Neurology						
Appleby (2019)	Neurology Rehabilitation	Systematic review assessing effectiveness of telerehabilitation for stroke patients k = 13 (RCTs) n = 10–81	Videoconference, telephone, wireless monitor Daily sessions to 3 times per week, from 10 days to 12 weeks Patient – provider	Patients generally satisfied with telerehabilitation compared with standard care (5/7 studies)	NR	NR

Study	Medical field	Study design, objectives, number of studies	Intervention	Satisfaction	Facilitators	Barriers
Yeroushalmi (2019)	Neurology Ongoing care	Systematic review to investigate types of telemedicine being utilised for patients with multiple sclerosis, and their outcomes k = 28 n = 12–1700	Videoconference, telephone, web-based system Ad hoc, follow-up duration 8 weeks to 6 months Patient – provider	Patients and therapists 'appear to be satisfied with telehealth' (5/5 studies)	Cost savings Improved access Convenience	Technological issues - Patients unable to use technology
Infectious Disease						
Burnham (2019)	Infectious Disease Ongoing care	Systematic review assessing effectiveness of telemedicine for management of infectious disease patients k = 18 n = 28–1,167,468	Videoconference, telephone Patient – provider Provider – provider	Higher patient satisfaction levels reported compared to standard care (>97% in 6 of 7 studies; 69% in 1 study)	Shorter hospital stays - Length of stay reduced by 2.6–30 days) (4/5 studies) - Equivalent length of stay (1 study)	NR
General Practice						

Study	Medical field	Study design, objectives, number of studies	Intervention	Satisfaction	Facilitators	Barriers
Downes (2017)	General Practice Consultation	Systematic review to investigate evidence of telephone consultation as an alternative to general practice visits k = 13 (systematic reviews, RCT) n = NR	Telephone Patients contact service as required Patient – provider	Similar degree of patient satisfaction reported with GP telephone consults compared to face-to-face consultation (1/1 studies)	Time savings - Telephone consultation time reduced compared to standard consultation (1 study, 1.5 minutes)	Ease of access
Lake (2017)	General Practice	Systematic review to assess measures related to safety, quality or governance of telephone triage and advice services k = 10 (systematic reviews) n = NR	Telephone Patient – provider	Patient satisfaction with telehealth found to be equivalent or superior to standard care (5/5 studies)	Clinician workload reduced	NR
Thiyagarajan (2020)	General Practice Initial consultation/ Ongoing care	Systematic review exploring patient and clinician experience when conducting videoconferences for primary healthcare k = 7 (RCTs, non-RCTs)	Videoconference Patient – provider	Patients 'very satisfied' with videoconference (94–99% of patients, 1 study)	Time- and cost-savings - Less time waiting for appointment - Less travel Convenience	Privacy issues Technological issues - Time lag

Study	Medical field	Study design, objectives, number of studies	Intervention	Satisfaction	Facilitators	Barriers
		n = 19–1,734		Patients more satisfied overall with face-to-face consultations (1 study)	Improved access	
Musculoskeletal						
Grona (2018)	Musculoskeletal Physiotherapy	Systematic review to examine impact of videoconferencing for physical therapy in musculoskeletal conditions k = 17 (RCTs, non-RCTs) n = NR	Videoconferencing sessions at patient's home Patient – provider	Patient satisfaction with telehealth high to very high (80–96%, 3/3 studies)	Time- and cost-savings - Less travel - Less accommodation	NR
Oncology						
Fournier (2018)	Oncology Genetic Counselling/ Education	Integrative review examining telephone counselling as an effective alternative to in-person counselling for people at high risk for hereditary breast or ovarian cancers k = 7 (RCTs, non-RCTs) n = NR	Telephone Patient – provider	Patient satisfaction with telegenetics and standard care were equivalent (2 studies)	Time- and cost-savings - Shorter sessions - Less travel, especially rural patients - Lower overhead costs - Cost savings for telegenetics ranged from $114–$380 per patient (2 studies)	NR
Liptrott (2017)	Oncology Ongoing care	Systematic review to assess patient perception and acceptability of telephone-	Telephone	Satisfaction with telehealth high (19 studies)	Time savings	NR

Study	Medical field	Study design, objectives, number of studies	Intervention	Satisfaction	Facilitators	Barriers
		based interventions in cancer patients k = 50 (non-RCTs, RCTs) n = 8–374 (sample size variously defined and often unclear)	1 to 10 sessions Ranging from before treatment to every 3 to 12 weeks Patient – provider	Telehealth superior to standard care (3 studies)	Convenience Accessibility	
Orthopaedics						
Gilbert (2018)	Orthopaedics Ongoing care/ Physiotherapy	Systematic review assessing patient acceptability of real-time videoconferencing for orthopaedic care k = 4 (observational trials) n = 5–28	Videoconferencing Patient – provider Provider – provider	4/4 studies concluded that videoconferencing is acceptable to patients	Time- and cost-savings - Providers more punctual - Less travel - Less childcare required Convenience	Inability to perform physical examination
Haider (2020)	Orthopaedics	Systematic review to investigate telemedicine in orthopaedics k = 21 (RCTs and non-RCTs) n = 17–630	Videoconferencing, telephone Patient – provider	Patients and physicians found telemedicine to be equivalent or superior to traditional visits	Time- and cost-savings - Shorter consultation - Less waiting time - Less travel - Less time off work	Implementation costs

Study	Medical field	Study design, objectives, number of studies	Intervention	Satisfaction	Facilitators	Barriers
Palliative Care						
Jess (2019)	Palliative care	Systematic review to assess evidence of video consultations in palliative care k = 39 (RCT, non-RCTs) n = 12–1,152	Videoconferencing Patient – provider	Patients, relatives and healthcare providers positive toward video consultations (18 studies)	Time- and cost-savings - Less distance travelled - User-friendly technology - Increased access	Technological challenges - Training for healthcare providers - Internet connection Lack of resources Increased workload Privacy issues
Endocrinology						
McLendon (2017)	Endocrinology Diabetes Primary care/ Ongoing care	Systematic review to investigate interactive telehealth models for diabetes care in rural primary care practice k = 14 (RCT, non-RCTs) n = 14–3,534	Videoconferencing, telephone, asynchronous technologies[a] 2 visits in 6 months 1-year follow-up Patient – provider	High patient satisfaction reported (6 studies)	Time- and cost-savings - Reduced travel - Reduced time off work - Accommodation - Food - Parking - Childcare - Convenience - Improved access	Inability to perform physical examination Implementation costs

Study	Medical field	Study design, objectives, number of studies	Intervention	Satisfaction	Facilitators	Barriers
All Specialities						
Orlando (2019)	All specialties Initial consultation/ Ongoing care	Systematic review to investigate if rural patients are satisfied with telehealth videoconferencing to manage their health k = 36 (Clinical trials, observational studies) n = 7–1,734	Videoconference Patient – provider	Patient satisfaction reported as 4.45–4.7/5 (3 studies) and >80% (16 studies)	Time- and cost-savings - Less travel - Convenience - Ease of use	Technology infrastructure
Zandbelt (2016)	All specialties Ongoing care	Systematic review to assess effects of e-consulting on satisfaction, time, cost and follow-up outcomes k = 21 (RCTs) n = 10–2,094	Videoconference, asynchronous technologies[a] Once per month 3 video consults over 6 months Patient – provider Provider – provider	Patient satisfaction with videoconference equivalent or superior to standard care	Time- and cost-savings - Less travel - Less time off work - Less childcare	Inability to perform physical examination

Abbreviations

k = number of included studies, n = number or range of participants in included studies, NR = not reported, RCT = randomised control trial

Notes

a = Asynchronous technologies are modalities of communication where the interactions between patient and provider, or provider and provider, are not simultaneous. Asynchronous technologies include, but are not limited to, email, text messaging, wireless monitoring devices, digital camera, smartphone apps, image-sharing systems, wearable devices and automated telephone calls.

Appendix C: AMSTAR 2 quality appraisal of systematic reviews

Table 6 Quality of included studies (AMSTAR 2)

	Components of PICO included	Review methods established prior to the review	Selection of the study designs explained	Comprehensive literature search strategy	Study selection in duplicate	Data extraction in duplicate	List of excluded studies provided	Included studies described in adequate detail?	Risk of bias assessed	Sources of funding for the studies included in the review	Account for RoB when discussing results	Heterogeneity of results discussed	Potential sources of conflict of interest/funding declared	Appropriate statistical combination for meta-analysis	Potential RoB assessed for meta-analysis	Score	Overall quality
Andrees (2020)	Y	N	N	Y	Y	N	N	Y	Y	N	Y	Y	Y	N/A	N/A	9	High
Appleby (2019)	Y	Y	N	PY	Y	Y	N	Y	PY	N	Y	Y	Y	N/A	N/A	10	High
Asiri (2018)	N	PY	N	Y	N	Y	N	Y	N	N	N	N	Y	N/A	N/A	5	Medium
Burnham (2019)	Y	Y	N	PY	Y	Y	N	Y	Y	N	Y	N	Y	N/A	N/A	10	High
Downes (2017)	Y	Y	N	Y	Y	N	N	PY	Y	N	N	N	Y	N/A	N/A	7	Medium
Eichberg (2020)	Y	N	N	PY	N	N	N	PY	N	N	N	Y	Y	N/A	N/A	5	Medium
Fournier (2018)	Y	N	N	Y	N	N	N	N	N	N	N	N	Y	N/A	N/A	3	Low
Gilbert (2018)	Y	Y	N	Y	Y	N	N	Y	PY	N	N	N	Y	N/A	N/A	7	Medium
Grona (2018)	Y	Y	Y	Y	Y	N	N	PY	Y	N	Y	N	Y	N/A	N/A	10	High
Gunter (2016)	Y	N	N	Y	Y	Y	N	PY	Y	N	Y	Y	Y	N/A	N/A	10	High
Haider (2020)	Y	N	N	Y	Y	Y	N	Y	Y	N	Y	Y	Y	N/A	N/A	10	High
Jess (2019)	Y	Y	Y	Y	N	N	N	Y	N	N	Y	Y	Y	N/A	N/A	8	High
Lake (2017)	Y	N	N	Y	Y	N	N	PY	PY	N	Y	N	Y	N/A	N/A	7	Medium
Liptrott (2017)	Y	N	Y	Y	N	N	N	Y	Y	N	Y	Y	N	N/A	N/A	8	High
McLendon (2017)	Y	N	N	PY	N	N	N	Y	N	N	N	N	Y	N/A	N/A	4	Medium
Melian (2020)	Y	N	N	PY	N	Y	N	Y	Y	N	Y	Y	Y	N	Y	10	High
Orlando (2019)	Y	Y	N	Y	Y	N	N	Y	PY	N	Y	Y	Y	N/A	N/A	10	High
Schoen (2019)	Y	N	N	Y	N	N	N	PY	PY	N	N	N	Y	N/A	N/A	6	Medium
Thiyagarajan (2020)	Y	Y	N	Y	Y	N	N	PY	Y	N	Y	N	Y	N/A	N/A	8	High
van de Meij (2016)	Y	N	N	Y	Y	Y	N	Y	Y	N	N	Y	Y	N/A	N/A	9	High
van Egmond (2018)	Y	Y	N	Y	N	Y	N	Y	Y	N	Y	Y	Y	Y	Y	12	High
Vyas (2017)	N	N	N	N	Y	Y	N	PY	N	N	N	N	Y	N/A	N/A	4	High
Yeroushalmi (2019)	Y	N	N	PY	Y	Y	N	Y	Y	N	Y	N	Y	N/A	N/A	8	High
Zandbelt (2016)	Y	N	N	Y	Y	N	N	Y	Y	N	Y	Y	Y	N/A	N/A	8	High

Notes N = no, Y = yes, PY = partial yes, N/A = not applicable. Score: High = 8 to 11, Medium = 4 to 7, Low = 0 to 3.

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