

CADTH RAPID RESPONSE REPORT: SUMMARY OF ABSTRACTS

# Asynchronous Tele dermatology Consultations Using Store- and-Forward Technology: Diagnostic Accuracy, Clinical Utility, and Cost- Effectiveness

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## Research Questions

1. What is the diagnostic accuracy of asynchronous teledermatology consultations using store-and-forward technology for the assessment of patients with suspected dermatological conditions?
2. What is the clinical utility of asynchronous teledermatology consultations using store-and-forward technology for the assessment of patients with suspected dermatological conditions?
3. What is the cost-effectiveness of asynchronous teledermatology consultations using store-and-forward technology for patients with dermatological conditions?

## Key Findings

One health technology assessment and thirteen non-randomized studies were identified regarding the diagnostic accuracy and clinical utility of asynchronous teledermatology consultations using store-and-forward technology for the assessment of patients with suspected dermatological conditions. One systematic review of economic evaluations and one economic evaluation were identified regarding the cost-effectiveness of asynchronous teledermatology consultations using store-and-forward technology for patients with dermatological conditions.

## Methods

### Literature Search Methods

A limited literature search was conducted by an information specialist on key resources including Medline, the Cochrane Library, the University of York Centre for Reviews and Dissemination (CRD) databases, the websites of Canadian and major international health technology agencies, as well as a focused internet search. The search strategy was comprised of both controlled vocabulary, such as the National Library of Medicine's MeSH (Medical Subject Headings), and keywords. The main search concepts were dermatology and telemedicine. No filters were applied to limit the results by study type. The search was also limited to English language documents published between January 1, 2015 and August 26, 2020. Internet links are provided, where available.

### Selection Criteria and Summary Methods

One reviewer screened literature search results (titles and abstracts) and selected publications according to the inclusion criteria presented in Table 1. Full texts of study publications were not reviewed. The Overall Summary of Findings was based on information available in the abstracts of selected publications. Open access full-text versions of evidence-based guidelines were reviewed when abstracts were not available, and relevant recommendations were summarized.

**Table 1: Selection Criteria**

<b>Population</b>	Adults, with or without comorbidities, in any health care setting.
<b>Intervention</b>	Store-and-forward technology for asynchronous teledermatology consultations.
<b>Comparator</b>	Q1: Reference standard: in-person consultation with a dermatologist. Q2-3: In-person consultation with a dermatologist
<b>Outcomes</b>	Q1: Diagnostic accuracy (e.g., sensitivity, specificity)

	Q2: Clinical utility (e.g., dermatological symptoms, quality of life, time to diagnosis, ability to diagnose) Q3: Cost-effectiveness (e.g., cost per quality-adjusted life years)
<b>Study Designs</b>	Health technology assessments, systematic reviews, randomized controlled trials, non-randomized studies, economic evaluations

## Results

One health technology assessment<sup>1</sup> and thirteen non-randomized studies<sup>3-15</sup> were identified regarding the diagnostic accuracy and clinical utility of asynchronous teledermatology consultations using store-and-forward technology for the assessment of patients with suspected dermatological conditions. One systematic review<sup>2</sup> of economic evaluations and one economic evaluation<sup>16</sup> were identified regarding the cost-effectiveness of asynchronous teledermatology consultations using store-and-forward technology for patients with dermatological conditions. No relevant randomized controlled trials were identified in the literature.

Additional references of potential interest that did not meet the inclusion criteria are provided in the appendix.

## Overall Summary of Findings

One health technology assessment<sup>1</sup> and thirteen non-randomized studies<sup>3-15</sup> were identified regarding the diagnostic accuracy and clinical utility of asynchronous teledermatology consultations using store-and-forward technology for the assessment of patients with suspected dermatological conditions. The authors of the health technology assessment<sup>1</sup> found results that provided uncertain evidence for the clinical utility and cost-effectiveness of the store-and-forward asynchronous teledermatology service. The authors of all thirteen of the non-randomized studies<sup>3-15</sup> found that store-and-forward and face-to-face consultations were comparable or equivalent in diagnostic accuracy and clinical utility. One systematic review<sup>2</sup> of economic evaluations and one economic evaluation<sup>16</sup> were identified regarding the cost-effectiveness of asynchronous teledermatology consultations using store-and-forward technology for patients with dermatological conditions. The authors of the systematic review<sup>2</sup> of economic evaluations found that store-and-forward technology can be cost-effective when used as a triage mechanism and for patients required to travel a far distance. The authors of the economic evaluation<sup>16</sup> found that store-and-forward teledermatology had positive results regarding the cost-effectiveness of the intervention compared to face-to-face consultations. A detailed summary of the identified studies can be found in Table 2.

**Table 2: Summary of Included Studies**

First Author, Year	Study Characteristics	Intervention	Comparator(s)	Relevant Outcomes Assessed	Author's Conclusions
<b>Health Technology Assessments</b>					
<b>MSAC, 2017<sup>1</sup></b>	Study Design: Health technology assessment	A store-and-forward asynchronous teledermatology service using digital	Current investigative services for dermatology	Safety and cost-effectiveness.	The authors concluded that they did not support public funding of

First Author, Year	Study Characteristics	Intervention	Comparator(s)	Relevant Outcomes Assessed	Author's Conclusions
	<p>Population: Patients with inflammatory skin conditions or suspected skin cancer who require referral to a specialist dermatologist</p> <p>N = NR</p>	images and patient history forwarded to a dermatologist	(Telehealth videoconferencing and face-to-face consultation)		asynchronous store and forward technology. The authors concluded that the evidence was uncertain on the effectiveness and cost-effectiveness of the intervention.
<b>Systematic Reviews &amp; Meta-Analyses</b>					
<b>Snoswell, 2016<sup>2</sup></b>	<p>Study Design: Systematic review</p> <p>Population: Patients experiencing dermatological consultations</p> <p>N = 11 relevant studies</p>	Store-and-forward teledermatology in a topical clinical setting	Conventional face-to-face care in a clinical setting	Comparison of cost-effectiveness	The authors concluded that evidence found suggested that store-and-forward technology can be cost-effective. The authors concluded that store-and-forward technology was cost-effective when used as a triage mechanism to reduce face-to-face consultations, with the cost-effectiveness increasing when patients were required to travel further distances to access dermatology services.
<b>Non-Randomized Studies</b>					
<b>Keller, 2020<sup>3</sup></b>	<p>Study Design: Prospective Cohort</p> <p>Population: Patients requiring inpatient dermatology consultation</p> <p>N = 100</p>	Store-and-forward teledermatology for teledermatologist diagnostic impressions and therapeutic recommendations	Hospitalist and dermatologist in-person diagnostic impressions and therapeutic recommendations	Complete and partial agreement between diagnostic impressions and therapeutic recommendations	The authors found that the dermatologist and teledermatologist agreed completely and partially in 84.9% and 52.8% of cases, respectively. The authors concluded that overall the teledermatologist performed comparably to an in-person

First Author, Year	Study Characteristics	Intervention	Comparator(s)	Relevant Outcomes Assessed	Author's Conclusions
					dermatologist for diagnosis and management of skin conditions for inpatients.
Kim, 2020 <sup>4</sup>	<p><b>Study Design:</b> Prospective Cohort</p> <p><b>Population:</b> Patients requiring consultation at Stanford Health Care</p> <p>N = 215</p>	eConsult referrals through PhotoCareMD, a store-and-forward teledermatology consultation service	In-person referrals prior to initiation of PhotoCareMD	Time to diagnosis/treatment and cancellation rate	The authors found that eConsults comparably decreased time to diagnosis and treatment from 23 days to 16 hours, with a 50% lower cancellation rate. The authors found that the average in-person consult required 25 minutes, compared to 8 minutes for an eConsult, with PhotoCareMD saving the clinic 13 hours.
Lee, 2020 <sup>5</sup>	<p><b>Study Design:</b> Retrospective Cohort</p> <p><b>Population:</b> Patients requiring preoperative dermatology consultation</p> <p>N = NR</p>	Store-and -forward teledermatology preoperative consults	Face-to-face teledermatology preoperative consults	Consult failure rates, treatment follow-through rates, time to treatment, and travel savings	The authors found comparable treatment completion rates, with teledermatology having significantly decreased consult failure rates. The authors found that teledermatology decreased the time to treatment by 2 weeks, increased the percentage of lesions treated within 60 days, and resulted in travel savings of 162.7 minutes, 144.5 miles, and \$60.00 per person.
Gemelas, 2019 <sup>6</sup>	<p><b>Study Design:</b> Retrospective Cohort</p>	Store-and-forward teledermatology consultation service	Face-to-face dermatology consultation in clinic	Positive predictive value of melanoma	The authors found that the teledermatology service had a positive predictive

First Author, Year	Study Characteristics	Intervention	Comparator(s)	Relevant Outcomes Assessed	Author's Conclusions
	<p><b>Population:</b> Patients requiring teledermatology consultations between February 2015 and January 2016</p> <p>N = 8,706</p>				value of 13.7%, which they concluded compared favorably to face-to-face dermatology consultations.
<b>Silveira, 2019<sup>7</sup></b>	<p><b>Study Design:</b> Prospective Cohort</p> <p><b>Population:</b> Patients monitored by routine cancer screening at Barretos Cancer Hospital during 2016</p> <p>N = 39</p>	Mobile phone application and website for doctor-to-doctor consultation of photos of skin lesions by skin care professionals	Standard dermatology consultation of skin lesions	The diagnostic sensitivity, accuracy, specificity, positive predictive value, and negative predictive value	The authors found equivalence in all measures between the teledermatology and face-to-face consultations. Specifically, the authors found the following results: sensitivity= clinic: 80.0%, teledermatology: 80.8%; accuracy= clinic: 78.9%, teledermatology: 79.5%; specificity= clinic: 76.9%, teledermatology: 76.9%; positive predictive value= clinic: 87.0%, teledermatology: 87.5%; and negative predictive value= clinic: 66.7.0%, teledermatology: 66.7%.
<b>Kravets, 2018<sup>8</sup></b>	<p><b>Study Design:</b> Prospective Cohort</p> <p><b>Population:</b> Patients requiring consultation for skin lesions</p> <p>N = 314</p>	Store-and-forward teledermatological platform for consultation	In person dermatologist consultation	Diagnostic accuracy	The authors found that the accuracy of teledermatological examination compared to clinical examination was 90.3 to 100% and compared to histopathological diagnoses was 85.1 to 98.9%.
<b>Raida, 2018<sup>9</sup></b>	<p><b>Study Design:</b> Prospective Cohort</p>	Store-and-forward teledermatology	In-person dermatological consultation	Time to consult, most frequent diagnoses, and average number	The authors found that the average time to consult in

First Author, Year	Study Characteristics	Intervention	Comparator(s)	Relevant Outcomes Assessed	Author's Conclusions
	<p><b>Population:</b> Patients requiring dermatological consult</p> <p>N = 395</p>	service for 6 months		of dermatology-related visits and dermatology-related costs.	the intervention group was 16.31 hours and the dermatology-related spend for the intervention and control group was 59\$ and \$113, respectively, on the day of consult, \$70 and \$202 for 30 days, \$78 and \$221 for 60 days, and \$86 and \$307 for 90 days.
Altieri, 2017 <sup>10</sup>	<p><b>Study Design:</b> Prospective Cohort</p> <p><b>Population:</b> Adult patients classified as having either lightly pigmented or darkly pigmented skin presenting with new, visible skin complaints in a Los Angeles dermatology clinic</p> <p>N = 232</p>	Store-and-forward technology teledermatology diagnosis and management	In-person dermatology diagnosis and management	Percent concordance and concordance rates between the intervention and comparator	The authors concluded that concordance rates for diagnostic testing, clinic-based therapy and treatments were similar for the intervention and comparison groups for both skin types.
Saleh, 2017 <sup>11</sup>	<p><b>Study Design:</b> Prospective Cohort</p> <p><b>Population:</b> Patients with dermatological ailments who attended the Abshway Hospital</p> <p>N = 600</p>	Teledermatology consultation in remote areas through a store-and-forward diagnosis with two teledermatologists	Patients examined by an on-site dermatologist face-to-face	Diagnostic agreement rates between the intervention and control setting	The authors found that diagnostic agreement rates between the face-to-face and the two teledermatologists were 86.7% and 87% respectively. Specifically, the authors found that 81.3% of cases showed complete agreement between all three physicians.
Tian, 2017 <sup>12</sup>	<p><b>Study Design:</b> Prospective Cohort</p> <p><b>Population:</b> Patients requiring aesthetic</p>	A store-and-forward telemedicine system in the field of aesthetic dermatology	Face-to-face examinations for aesthetic dermatology	Agreement rates between the intervention and control setting	The authors found that there was total agreement between 342 diagnoses, with a concordance rate of 95.5%. The authors concluded



First Author, Year	Study Characteristics	Intervention	Comparator(s)	Relevant Outcomes Assessed	Author's Conclusions
	dermatology consultation  N = 102				that the store-and-forward system enabled an accurate skin diagnosis for conditions such as melanomas, skin cancers, actinic keratosis, and other dangerous diagnoses. The authors concluded that the discordant diagnoses were mostly attributable to poor photograph quality.
<b>Wang, 2017<sup>13</sup></b>	<b>Study Design:</b> Retrospective Cohort  <b>Population:</b> Veterans diagnosed with melanomas  N = 61	Store-and-forward teledermatological diagnoses of melanoma	Face-to-face diagnoses of melanoma	Diagnosis and management accuracy of melanomas	The authors concluded that diagnostic and management accuracy of store-and-forward was comparable to face-to-face consultation. Specifically, the authors found that 74% of melanomas were correctly diagnosed and 93% were correctly managed through the store-and-forward technology.
<b>Okita, 2016<sup>14</sup></b>	<b>Study Design:</b> Prospective Cohort  <b>Population:</b> Inpatients requiring dermatological evaluation  N = 100	Store-and-forward teledermatology with data and pictures sent to consultants by e-mail for two months	Face-to-face evaluation of dermatological consults	The total and partial agreement and disagreement between the doctors	The authors found that the total agreement between modalities was 54%, partial agreement was 27%, and disagreement was 19%. The authors concluded that the disagreements were related to the inexperience with the store-and-forward platform.

First Author, Year	Study Characteristics	Intervention	Comparator(s)	Relevant Outcomes Assessed	Author's Conclusions
<b>Nami, 2015<sup>15</sup></b>	<p><b>Study Design:</b> Prospective Cohort</p> <p><b>Population:</b> Patients seeking dermatological consultation</p> <p>N = 391</p>	Store-and-forward mobile teledermatology consultation	Face-to-face dermatological consultation	Concordance rates between the two modalities, time taken for teleconsultation	The authors found that there was a concordance rate of 91% between the two modalities, and that only a few minutes needed to be added to a normal visit in order to transmit the cases to a teledermatologist for the store-and-forward consultation.
<b>Economic Evaluations</b>					
<b>Yang, 2019<sup>16</sup></b>	<p>Study Design: Retrospective Cohort</p> <p>Population: Underserved individuals requiring dermatology consultation</p> <p>N = 700</p>	Store-and-forward teledermatology program	Conventional dermatological consultation	The comparison of cost for each patient case between the two modalities	The authors found that compared with the conventional care, the teledermatology had a mean expected cost savings of \$10.00 to \$52.65 dollars per consult. The authors also found that through the use of teledermatology, 27% of in-person consults and 3.29% of emergency room visits were avoided.

MSAC = Medical Services Advisory Committee; N = number; NR = not reported.

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## Systematic Reviews and Meta-analyses

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## Randomized Controlled Trials

No literature identified.

## Non-Randomized Studies

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## Appendix — Further Information

### Systematic Reviews & Meta-Analyses

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See pg. 54 study #1, pg. 70 studies #2-3, pg. 71 study #3, pg. 72 study #1