Title: **Improving care quality with prison telemedicine: the effects of context and multiplicity on successful implementation and use**

First authors: Chantal Edge, UCL Collaborative Centre for Inclusion Health

Correspondence details: c.edge@ucl.ac.uk

Postal Address: Room 350, 1-19 Torrington Place, Fitzrovia, London WC1E 7HB, UK

Co-authors:

- Dr Georgia Black, UCL Department of Applied Health Research
- Mrs Emma King, UCL Collaborative Centre for Inclusion Health
- Dr Julie George, UCL Institute of Health Informatics
- Dr Shamir Patel, Central North West London NHS Foundation Trust
- Dr Andrew Hayward, UCL Institute of Epidemiology and Health Care

ABSTRACT

Background

Prison telemedicine can improve the access, cost and quality of healthcare for prisoners, however adoption in prison systems worldwide has been variable despite these demonstrable benefits. This study examines anticipated and realised benefits, barriers and enablers for prison telemedicine, thereby providing evidence to improve the chances of successful implementation.

Methods

A systematic search was conducted using a combination of medical subject headings and text word searches for prisons and telemedicine. Databases searched included: PubMed, Embase, CINAHL Plus, PsycINFO, Web of Science, Scopus and International Bibliography of the Social Sciences. Articles were included if they reported information regarding the use of/advocacy for telemedicine, for people residing within a secure correctional facility. A scoping summary and subsequent thematic qualitative analysis was undertaken on articles selected for inclusion in the review, to identify issues associated with successful implementation and use.

Results

1882 non-duplicate articles were returned, 225 were identified for full text review. A total of 163 articles were included in the final set of literature. Important considerations for prison telemedicine implementation include: differences between anticipated and realised benefits and barriers, differing wants and needs of prison and community healthcare providers, the importance of top down and bottom up support and consideration of logistical and clinical compatibility.

Conclusions

When implemented well patients, prison and hospital staff are generally satisfied with telemedicine. Successful implementation requires careful consideration at outset of the partners to be engaged, the local context for implementation and the potential benefits that should be communicated to encourage participation.

BACKGROUND

Prisoners have poorer access to healthcare than people living in the community, despite multiple national and international directives which cite the right of prisoners to equivalence of health care(1, 2).

Increased health inequalities experienced by prisoners are compounded by greater barriers to accessing healthcare services to meet those needs. Prisons by their very nature are secure environments, concerned primarily with delivering the order of the courts, and access to healthcare is operationalised within these constraints. Prisoners requiring access to health services not located on-site at the prison, for example secondary care, must be escorted off-site to the treatment provider(3). This can incur large costs due to the resources required to ensure the transfer is conducted securely such as escort by prison officers. In addition other factors may discourage prisoners from seeking off-site care, such as the stigma experienced from wearing handcuffs at community hospital sites. Given the resource requirement for off-site transfer and the high burden of disease experienced by people in prison, it is also not unusual for patients to experience lengthy waits before commencing treatment.

Telemedicine consultations have been used in prisons worldwide to reduce inequities in healthcare access experienced by prisoners(4-10). Numerous reports have been published demonstrating their effectiveness as a method of healthcare delivery in secure settings and a systematic review of cost effectiveness and outcomes(11) is underway. Despite good evidence of effectiveness, adoption in many countries has been limited to date. Interest in the field of telemedicine, especially its application to the field of correctional healthcare is growing, mainly due to the anticipated improvements in both access to care and cost effectiveness demonstrated by individual models elsewhere(12-15). However, evidence of effect, although vital in making a case for a prison telemedicine intervention, is not in itself sufficient to support the design and implementation of a new local model. It has long been recognised that the implementation and normalisation of technological interventions in healthcare systems is complex and prone to failure(16, 17). Digital interventions although largely fixed in their nature at outset, are inserted into a social system, inevitably modifying resulting use and effectiveness of the intervention. Therefore, when considering locally whether to pilot a previously 'successful' digital intervention such as video consultations, one must consider the context in which it was originally deployed and whether crucial supporting factors for implementation, or known barriers to success are in place in the newly proposed location(18).

Within this review we seek to understand contextual factors that contribute to the implementation of prison telemedicine, and to define higher order constructs that should be considered in the decision of whether to implement prison telemedicine. Introduction of technology into healthcare settings requires cultural and organisational shifts(17) and for this reason we have conducted a systematic review drawing on these aspects of implementation as opposed to clinical outcomes.

In this review, the term *prisoner* refers to both convicted and pre-trial (on remand) persons held in prisons, jails, detention and other penal institutions.

METHODOLOGY

This review adopted a hybrid approach to analysis(19), combining scoping study methodology following the Arksey and O'Malley scoping review framework(20)with thematic qualitative analysis of documents selected for full review(19-22). We identified a recent scoping study on prison

telemedicine however have reported a brief summary of our scoping review given that we included grey literature and no restriction on publication date.(23) A systematic literature search was undertaken (Supplementary Table 1) with records retrieved subject to title-abstract screen by two independent reviewers, followed by full text review for inclusion in the review. The following databases were searched for literature for inclusion in this review: PubMed, Embase, CINAHL Plus, PsycINFO, Web of Science, Scopus and International Bibliography of the Social Sciences (IBSS). No restriction was placed on publication date given that the field of evidence was expected to be limited and issues with implementation not necessarily subject to change over time.

Articles were included in the review if they reported information on video consultations for healthcare in a correctional setting. A full list of search terms and inclusion/exclusion criteria are provided in Supplementary Table 1. As the literature reviewed were predominantly process papers it was not possible to define quality criteria for inclusion.

Figure 1: PRISMA flow diagram

Articles selected for inclusion were analysed in NVIVO 12 for implementation issues using an inductive coding process. To scope the field of prison telemedicine articles were also categorised by the following fields if reported: country of publication, clinical specialty, type of research, date of publication, author, adults/juvenile, type of prison, male/female prison, successful/unsuccessful model.

RESULTS

The systematic literature search yielded 2328 papers of which 446 were duplicates and 1657 were removed after title-abstract screen in EndNote by two independent reviewers. Of those remaining 8 could not be located and 54 were excluded after full text review. In total 163 articles were included in the review and subject to qualitative analysis and scoping review. One recently published paper pertaining to staff perceptions of telemedicine implementation and use was identified in the review stage of the paper and was included in subsequent drafts.(24)

Overview of studies in the review

Geography

Despite the well evidenced contribution prison telemedicine can make to improving care quality for prisoners, implementation and adoption has varied by geography. The USA is by far the most prolific publisher of literature on prison telemedicine (n=113), consistently documenting its experiences with telemedicine since 1995(25-27) (Figure 2, Supplementary Figure 1). Indeed it was not until 2001 that any other country published in this topic area, when Australia entered the domain(28) and continued to become the second most highly published country in this field (n=11).(6, 29-37) Both countries are geographically extensive, making telemedicine an attractive option both for healthcare

professionals to avoid long-distance travel, and for prisons to reduce high cost, long-distance inmate transfer.

Figure 2 Number of publications on prison telemedicine by country

Clinical specialty

A diverse range of clinical specialties are reported in the literature as being successfully delivered over telemedicine in prison (Supplementary Table 2), with the most frequently reported specialties being telepsychiatry, hepatology, HIV, cardiology, musculo-skeletal and dermatology.

Types of studies reported

The majority of articles retrieved were peer reviewed primary research articles (n=58), closely followed by commentaries (n=51), most often describing operational telemedicine models and advocating for their wider use and implementation (Supplementary Figure 2).

Type of prison and gender of study population were rarely reported in the literature reviewed.

Overview of telemedicine outcomes

Quantitative outcomes data reported varied from correlation between in-person/telemedicine assessment scores(38), numbers of consultations(39-42), patient satisfaction scores(43), cost effectiveness(34, 44-50) and clinical outcome measures(51, 52). Very few studies reported outright failures of telemedicine(53, 54), with most finding it to offer equivalent or improved care quality(5, 42, 43, 51, 52, 55-70) at an acceptable cost(8, 9, 25, 31, 34, 38, 43, 47, 50, 53, 56-59, 62, 64, 69-110). Of those studies that measured or reported on patient satisfaction, most found telemedicine satisfactory or even preferred by patients(8, 12, 58, 60, 62, 64, 65, 71-73, 80, 82, 83, 85, 88, 93-95, 99, 104, 105, 111-121) (Table 1). The process of travelling offsite is generally seen as disruptive and inconvenient by patients, and the environment highly stigmatising due to the handcuffs and presence of prison officers in line with security policies(5, 9, 39, 59, 71, 72, 83, 84, 105, 106, 109, 110, 122, 123). Telemedicine was seen, for the most part, to address these concerns and provide a convenient and low stigma model for healthcare delivery(9, 37, 39, 59, 71, 72, 83, 84, 105, 106, 109, 110, 122-124). In some instances it even offered a more conducive atmosphere for patient disclosure(62,63,74).

Implementing telemedicine: contextual issues

How to combine “Top-Down” and “Bottom-up” support

Senior political buy in, both prior to and during implementation of prison telemedicine is crucial to supporting model development. Many areas that have achieved success with prison telemedicine implemented models based on an initial decision made at a senior political level, with the source of this support varying, from Countrywide Acts and Laws,(46, 125) to Ministry of Justice (or equivalent)(38, 112, 115, 126) through to State level support(65, 69, 95). This offer may be in the form of provision of funding(70, 72-74, 84, 111, 112), or use of a visionary or coalition-building approach to change(95). Studies also reported that within the prison community itself, the Governor or Prison Warden (the most senior member of the facility) also needs to be fully supportive of the proposed change within their domain(66). However the ease of engaging with these partners is also context dependant. In countries such as the USA there is a clear chain of command by which prison healthcare services are commissioned or directly provided by and report to the correctional system, who also maintains financial responsibility for healthcare provision in prisons, and sees the financial benefit telemedicine accrues.(88, 89) In countries such as England, the separation of prison and community commissioning within the National Health Service (NHS), and their independence from the justice system means a multiplicity of stakeholders must be engaged at a senior level and convinced to align on a direction of travel that will offer potentially unequal costs and benefits to all involved.(127) For example hospital budgets may not benefit from cost savings attributed to reduced prison escort costs and may even suffer if the tariff provided for a telemedicine appointment is reduced in comparison to in-person appointments.(34, 86) In Australia, increased pharmacy costs for hepatitis medication associated with a telementoring model increased the risk of prison pharmacy overspends, with reimbursement for prescriptions directed back into the general health service budget as opposed to the prison.(24)

Even if senior parties are engaged and enthused about telemedicine, models will likely fail without bottom-up staff support upon implementation. Few studies reported failure or focussed on hesitancy surrounding telemedicine, but those that did found staff support and acceptance to be critical.(53, 54, 70) The attitude of staff to telemedicine models at outset tends to be one of scepticism. As concluded by Magaletta et al (1998)

"Contempt prior to investigation and the lack of an adventurous spirit are the only limiting factors that would preclude such a revolution"(41)

Fear of change, provision of substandard care and a loss of personal autonomy are amongst some of the issues that concern staff prior to and during telemedicine implementation, common to both prison and hospital healthcare staff.(66) In Greece a technically well-functioning telemedicine model failed due to staff resistance, with hospital staff insistent they required additional pay to provide telemedicine services and prison staff reluctant to relinquish autonomy over decisions to transfer patients to hospital .(53) Review of the East Carolina University hospital prison telemedicine system reported the top three barriers to telemedicine success as physician acceptance at the prison, nursing acceptance at the prison, and physician acceptance at the medical school.(59)

In prison health systems with contracted or integrated secondary care clinicians, such as in the USA, use of telemedicine could be seen as a way of raising revenue for private practice, and altered modes of working can be readily included within medical staff job descriptions. This may reduce the need to provide such a 'hard sell' of telemedicine to clinicians, as may be required when financial and contractual levers are not in place to motivate staff. Where staff are not contracted by their primary employer to provide prison specific services, it is less clear how to demonstrate the need for telemedicine implementation and for this to compete with broader service priorities within the health system.

Demonstrating need versus benefits

The main anticipated benefits for correctional systems that drove initial implementation of the majority of prison telemedicine models were often unrelated to health. The case for change most frequently cited was reducing off-site transfer of patients, which was generally anticipated to vastly reduce resource costs(4, 6-9, 12, 21, 31, 34, 38-42, 44, 45, 47, 49-54, 56, 59-62, 64, 66, 69, 70, 72, 73, 76, 78, 84, 87-89, 95, 96, 99, 112, 114, 115, 120, 123, 124, 128-140) whilst also improving security and public safety and reducing the opportunity for prisoner escape(8, 34, 39, 41, 43, 47, 58-60, 70, 80, 85, 88, 89, 115, 122, 129-133, 138, 141). Secondary to this, telemedicine was expected to improve access to healthcare specialists in part by reducing the distances required for them to travel to attend prison or for prisoners to attend hospital(6, 12, 37, 38, 40, 41, 50, 52, 58, 59, 62, 68-70, 74, 75, 80, 85, 88, 89, 99, 100, 105, 111, 112, 135, 136, 142-144), and also through improved recruitment of staff who may currently be reluctant to work or travel to prison establishments.(37, 41, 68, 69, 80, 85, 102, 118, 123, 136, 142, 143, 145) This improved access was expected in turn to improve quality(40, 41, 43, 47, 53, 59, 60, 62, 69, 74, 75, 85, 88, 89, 102, 105, 112, 114, 116, 124, 128, 130, 131, 146, 147) and continuity of care(41, 47, 62, 74, 75, 96, 100, 102, 130, 144, 145) and potentially reduce litigations resulting from insufficient healthcare access.(40, 49, 59, 60, 88, 89, 96, 130, 132, 148)

These results suggest the most effective way to build enthusiasm and support for a prison telemedicine model is to emphasise the potential practical and economic benefits rather than building a case solely on the need for improved care quality. For example, the argument presented in favour of telemedicine by Sinha (2000) reported the problems with hospital based consultations as,

> "[…] this was not a desirable system because it compromised community safety, it was expensive, and physicians did not want shackled inmates in their waiting rooms"(131)

as opposed to issues faced by patients themselves.

Anticipated versus experienced outcomes

The anticipated benefits of telemedicine did not always match the benefits that were realised. (Table 1).

As expected, the most frequently cited post-implementation benefit was a reduction in costs associated with prisoner transfer to healthcare facilities,(8, 9, 25, 31, 34, 38, 39, 43, 46-48, 50, 53, 56-59, 62, 64, 69-110, 113, 149) as well as improved security.(8, 9, 43, 46, 47, 50, 57-59, 64, 65, 68-71, 73, 77, 78, 80, 83, 86-88, 101, 104, 110, 122) In New Jersey telemedicine was found to save around $100 per consultation(79), whilst more modest savings of $8.48 per consult were seen in Ohio, although these were hypothesised to increase as telemedicine usage increased.(47) In terms of safety a reduction in risk to the public, to the community healthcare providers and to prison officers were all acknowledged.

Additional benefits realised were predominantly health-related such as improved quality of care, resulting from increased access and specialist input.(5, 9, 24, 37, 46, 50-52, 57, 59, 61, 64, 68-70, 73,

77, 83, 88, 89, 93, 97, 101-103, 105-107, 116, 118, 124, 129, 135, 143, 146, 148, 150-153) For example, in juvenile justice facilities more timely delivery of behavioural health counselling over telemedicine gave students improved chances to develop coping techniques for interpersonal relationships, with acceptance of therapy also thought to be improved due to the adolescents preference for use of technological solutions.(148) In Illinois telemedicine facilitated multi-disciplinary input for HIV care, which subsequently improved prescribing practices, patient safety and the management of long-term conditions secondary to HIV infection.(102) In Australia the success of a remote hepatitis telementoring service meant that patient numbers eventually had to be capped, additional remote clinic sessions had to be scheduled and patients subject to prioritisation for clinic access. (24)

Many studies stated that telemedicine care was equivalent to in-person care,(42, 43, 55-67) whilst a further subset captured improved patient outcomes as a result of telemedicine introduction.(5, 51, 52, 58, 59, 61, 65, 68-70) For example, CD4 count in telemedicine treated HIV patients was found to be higher than in those using a traditional treatment model, with higher CD4 counts linked to improvements in morbidity and mortality and a reduction in risk of HIV transmission. This was hypothesised to be due to the specialist care available over telemedicine, as opposed to in-house non-expert care. (52) In Texas telemedicine was found to be central to the effective management of chronic disease in prisoners, showing statistically significant reductions in lipids and blood glucose of those treated using the model. (5)

Other unexpected benefits related to staff, such as upskilling of prison staff in disease management,(51, 72, 103, 134, 154) prison staff collaboration with secondary care specialists(37, 50, 64, 72, 105) and opportunities for wider training.(12, 37, 41, 59, 68, 79, 86, 155) The literature reported a diverse range of specialties that prison staff were able to engage with and learn from including palliative care and oncology, (105) hepatitis C, (103) HIV,(51) and cardiology.(134) Telementoring, a service whereby staff are upskilled to provide specialist treatment (as opposed to direct delivery of specialist treatment) increased staff knowledge and confidence and resulted in prescriptions being written predominantly by prison healthcare staff as opposed to specialist hospital clinicians.(24) Emphasising these staff benefits in advance of implementation could improve staff buy-in and support for model development.

Linking prison and healthcare providers

Implementation frameworks acknowledge the important part that provider staff and organisational culture play in the successful implementation and normalisation of interventions to deliver patient care.(17, 18) Within prison telemedicine an additional challenge is the cooperation between hospital and prison healthcare staff and services acting as ‘providers’, both with different beliefs and drivers around telemedicine, differing governance structures and receipt of an unequal share of costs and benefits accrued. Indeed, the characteristics of the hospital and prison healthcare staff emerged as one of the most important determinants of success within reports of prison telemedicine. In particular, staff perceptions, beliefs and attitudes were able equally to stifle the success of operational telemedicine models, or to drive them through difficult circumstances to succeed.(64, 74, 89, 115, 126) For example in the Ohio correctional telemedicine system the support of three champions drove the development of a successful model, despite reservations from prison doctors

(95) whilst one paper from the UK warns that failure to secure prison staff support for telemedicine may lead to sabotage of the model.(12)

It is important to recognise that wants and needs, benefits and fears of telemedicine will vary by provider group and that all partners have anticipations that differ to reality upon implementation, as demonstrated in Table 1. The literature reviewed suggests few benefits for hospital staff are expected prior to implementation, however upon implementation hospital staff were appreciative of improvements to care that could be delivered such as multidisciplinary input from prison healthcare staff (65), whilst also reporting personal benefits such as increased feelings of safety,(43, 65, 69, 97, 104) opportunities to do research(5, 9, 41, 72, 98) and a reduction in clinician burnout. (41, 65, 68) Prison healthcare staff meanwhile were appreciative of the opportunity to upskill in disease management (12, 24, 30, 37, 50, 51, 61, 64, 68, 70, 72, 99, 103, 105, 106, 118, 134, 145, 154, 156), collaborate with hospital specialists (37, 50, 64, 71, 72, 105, 106) and to ultimately provide more multi-disciplinary care (30, 37, 41, 52, 59, 64, 69, 72, 74, 83, 102, 103, 105, 107, 114, 115, 123, 134, 145, 157-159), all benefits that were not foreseen at outset of implementation.

There were frequently additional barriers encountered that were not anticipated at the outset of telemedicine usage, showing the importance of process evaluation throughout model development. Hospital clinicians frequently reported concerns over legal issues such as the potential for litigation over clinical care provided (37, 58, 65, 78, 98, 101, 135) and difficulties with practising across state boundaries in the USA. (59, 65, 78, 98, 101, 120, 135, 139, 160) Once the model was in use hospital clinicians also expressed concerns over the lack of formal guidelines for telemedicine usage, (9, 12, 143) most likely feeding into fears of litigation. Within prison healthcare providers, aside from expected issues around staff attitudes, additional barriers such as the admin burden of scheduling appointments, (9, 100, 112, 116) lack of private consultation spaces(70, 118), underestimated demand(38, 65, 73) and the length of time to re-coup the cost of telemedicine set-up(50, 72, 159), were all encountered. One study reported that despite the increased administrative burden of co-ordinating and preparing for appointments, staff efficiency at undertaking these tasks ultimately improved.(24) Finally patients often showed a lack of trust in the model(70, 71, 115, 121, 146, 156), or were concerned about the privacy it offered(37, 65, 69, 73, 83, 120, 129, 142), showing the importance of engaging service users in model design and evaluation throughout.

Perceived benefits drive willingness to implement and an appreciation of the barriers and enablers likely to be realised support successful implementation. When considering anticipated and realised benefits, barriers and enablers, it is important to do so by each provider group given that difficulties encountered and perceived advantages are likely to be different. As benefits are mostly accrued by prison services and patients themselves rather than by hospital services it can be challenging to convince both senior and frontline hospital staff of potential gains. A careful consideration of local organisational priorities and their potential alignment with telemedicine may help to support the case for change, as can the use of telemedicine 'champions' drawn from a pool of staff enthused about the potential telemedicine may offer.

Those planning implementation should separate out the concerns and enablers relevant to these different groups and ensure they are mitigated or communicated appropriately.

Table 1: Perceived and realised benefits, barriers and wider enablers to prison telemedicine, by stakeholder group (points in *italics* realised but not anticipated)

Logistics and clinical compatibility

A practical but nonetheless important determinant of success is that of intervention compatibility with clinical care. Clinical and technological factors were the most frequently raised barriers, alongside staff issues, to the use and success of telemedicine in prisons. Equipment issues ranged from poor audio, visuals and connectivity,(70, 104, 115) to problems with immobility or remote control by hospital physician.(39)

Amongst publications reports of successes with general telemedicine models were the most common output (Supplementary table 2). In terms of specific conditions, publications were heavy in the fields of psychiatry and hepatitis, both purported to lend themselves well to the telemedicine medium, and known to be of a high prevalence amongst prisoners.

Numerous studies advocated for a formal needs assessment process prior to a decision to implement change,(9, 72, 73, 80, 99) with this assessment determining priority clinical specialties for delivery, identifying suitable prisons for implementation and to justify and act as a general call to action. Furthermore, within individual clinical specialties there were, as expected, some diagnoses that lent themselves more readily to telemedicine. For example, within telepsychiatry, patients with thought disorders appeared more satisfied with the remote telemedicine medium than those diagnosed with affective disorders.(115) Consideration of peripherals required to make optimal use of the telemedicine consultation or care pathway, the associated cost of these peripherals and the expertise required to operate them, will also be instrumental in guiding the choice of initial specialities to pilot within a prison setting (Supplementary Exhibit2). Technology must be fit for clinical purpose and reliable.

Finally, alongside non-suitability of certain clinical conditions, departments must acknowledge that some patients may be unsuitable for telemedicine consultations given the nature of their condition e.g. acutely psychotic thoughts involving fear of technology.(146, 149) In addition, security considerations around certain patients and restrictions on their access to technology (as part of their custodial sentence) may limit the ability of some patients to access telemedicine consultations.

In summary, implementation of prison telemedicine is complex given the multiplicity of partners who must be involved and satisfied at both senior organisational and frontline levels, and the juxtaposition of health and justice contexts. The duality of service providers and their differing needs, wants and beliefs must be satisfied within the correctional context. The culture within correctional facilities may be averse to change and “risk-taking”, with most day to day operations focussed on the reduction of risk and security considerations,(66, 143) while health care is typically considered to be secondary to these priorities. The geographical context (in terms of physical distances between the correctional system and healthcare providers) can further influence and shape enthusiasm for telemedicine at both senior and frontline levels (Figure 3).

Figure 3 Layers of context influencing prison telemedicine implementation

The implementation team, ideally comprised of staff from the hospital, prison healthcare and wider prison operational departments should together answer the following logistical questions prior to model design (Figure 4).

Figure 4 Checklist for prison telemedicine implementation

Future research should encompass prospective analysis of the anticipated barriers to telemedicine implementation and normalisation, perhaps most notably for patients, and for hospital provider staff who are unlikely to see significant financial gains. Documentation of model changes during implementation and assessment of how implementation differed from staff expectations at outset would also be valuable. Finally, no published telemedicine needs assessments are available to understand how providers prioritise clinical specialties for telemedicine delivery.

LIMITATIONS OF THIS REVIEW

This review has several limitations. Firstly, some articles identified in the literature search could not be retrieved despite request through the University library. Second, this review reports information pertaining only to video consultations in prisons, we recognise that implementation issues may be common for other forms of telehealth within the correctional environment. Thirdly, we did not review papers that were not published in English language.

CONCLUSION

Prison telemedicine has the potential to make significant improvements to the health outcomes of a traditionally underserved population with substantial health needs. It can deliver better access and quality of care whilst offering wider system benefits across all stakeholders involved such as demonstrable cost savings, patient satisfaction and upskilling of staff. However it can only deliver these benefits if the implementation is successful. Implementation and normalisation of prison telemedicine requires cultural and organisational shifts across a variety of different system partners. Those who wish to implement a model afresh will need to scope widely the partners to be engaged, consider the context they work within and the anticipated benefits that will encourage them to commit resource to support implementation or change practice. When implemented well, provider staff from both institutions, correctional facilities and most importantly patients, were generally satisfied with telemedicine care.

AUTHOR CONTRIBUTION: CE conceived the project. CE defined the search terms and performed the initial literature search. CE and EK reviewed and appraised the titles returned from the search. CE and GB defined the qualitative analysis process. CE wrote the initial manuscript. All authors contributed to drafting, revision and approval of the manuscript.

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REFERENCES

Table 1: Perceived and realised benefits, barriers and wider enablers to prison telemedicine, by stakeholder group

	Correctional system	Hospital provider	Prison healthcare provider	Patient[£]
Perceived Benefits	• Reduction in patient transfers[(34, 39, 41, 112, 131)] • Cost savings[(34, 39, 41, 112, 119, 132)] [(8, 9, 12, 31, 34, 38-42, 47, 49, 50, 52, 59, 60, 62, 64, 69, 70, 72, 73, 76, 78, 84, 87-89, 95, 96, 99, 112, 114, 115, 120, 123, 124, 128-138)] • Improved security & public safety[(8, 34, 39, 41, 43, 47, 58-60, 70, 80, 85, 88, 89, 112, 115, 119, 122, 126, 129-133, 138, 141)] • Reduced litigation [(40, 49, 59, 60, 88, 89, 96, 130, 132, 148)] • Prison officer time freed up[(34, 41, 47, 60, 64, 73, 85, 89, 96, 129, 130, 134, 138, 144, 153)] • Reduced unrest and violence in prison[(41, 64, 88, 119)] • Improved access to care[$] [(6, 12, 37, 38, 40, 41, 50, 52, 58, 59, 62, 68-70, 74, 75, 80, 85, 88, 89, 99, 100, 105, 111, 112, 135, 136, 142-144)] • Improved quality of care[$] [(40, 41, 43, 47, 53, 59, 60, 62, 69, 74, 75, 85, 88, 89, 102, 105, 112, 114, 116, 124, 128, 130, 131, 146, 147)]	• Reduction in staff travel[(37, 38, 120, 136)] • Less discomfort for other patients in same waiting room with prisoner[(71, 98, 104)]	• Improved staff recruitment [(40, 41, 43, 47, 53, 59, 60, 62, 69, 74, 75, 85, 88, 89, 102, 105, 112, 114, 116, 124, 128, 130, 131, 146, 147)] • Improved access to specialist hospital clinicians[(129)] • Improved care continuity [(41, 47, 62, 74, 75, 96, 100, 102, 130, 144, 145)] • Reduced litigations[(60)] • Staff training opportunity[(111, 137, 145, 159)] • Reduced clinician isolation[(130)] • Staff time free'd up[(112)] • Improved access to care[$] [(6, 12, 37, 38, 40, 41, 50, 52, 58, 59, 62, 68-70, 74, 75, 80, 85, 88, 89, 99, 100, 105, 111, 112, 135, 136, 142-144)] • Improved quality of care[$] [(40, 41, 43, 47, 53, 59, 60, 62, 69, 74, 75, 85, 88, 89, 102, 105, 112, 114, 116, 124, 128, 130, 131, 146, 147)]	• Improved care continuity [%] [(41, 47, 62, 74, 75, 96, 100, 102, 130, 144, 145)] • Improved access to care[%] [(6, 12, 37, 38, 40, 41, 50, 52, 58, 59, 62, 68-70, 74, 75, 80, 85, 88, 89, 99, 100, 105, 111, 112, 135, 136, 142-144)] • Improved quality of care[%] [(40, 41, 43, 47, 53, 59, 60, 62, 69, 74, 75, 85, 88, 89, 102, 105, 112, 114, 116, 124, 128, 130, 131, 146, 147)]
Actual Benefits	• Reduction in patient transfers • Cost savings[&][(8, 25, 31, 34, 38, 43, 47, 50, 53, 56-59, 62, 64, 69-109)] • Improved security & societal safety[(8, 9, 43, 46, 47, 50, 57-59, 64, 65, 68-71, 73, 77, 78, 80, 83, 86-88, 101, 104, 110, 122)] • Prison officer time freed up[(73)] • Reduced unrest and violence in prison[(64, 69, 88)] • Reduced risks to staff escorting prisoners[(57, 70, 92)] • Less prisoner complaints about healthcare[(88, 98)]	• Reduced need for clinician travel[(5, 38, 41, 43, 62, 65, 67, 79-81, 91, 100, 103, 104, 112, 151, 161-163)] • *Added dimension of contextual reporting from prison healthcare staff (who do not normally attend hospital appointments)[(65)]* • *Equivalent/improved quality of care [(5, 42, 43, 51, 52, 55-70)]* • *Junior staff training opportunity with unusual patients that may not otherwise get to treat[(50)]* • *Improved feeling of clinician safety[(43, 65, 69, 71, 98, 104, 161)]* • *Reduced discomfort for other patients in a hospital setting[(123)]* • *Reduced risk to other patients in hospital setting[(72)]* • *Increased revenue from private practice[(80)]* • *Cost saving[(39, 149)]* • *Better patient disclosure[(37, 98, 111, 122, 148)]*	• Improved staff recruitment & retention[(93, 97, 102-104)] • Improved access to specialist hospital clinicians[(29, 43, 65, 70, 80, 91, 93, 97, 104)] • Improved access to care[%][(5, 9, 22, 24, 26, 29, 30, 33, 37-39, 41-43, 47, 49, 50, 52, 56-59, 62, 64, 69, 70, 73-77, 81, 82, 87, 88, 90-93, 96, 97, 100-104, 107, 108, 110-112, 116, 118, 123, 124, 126, 127, 129, 131, 134, 136, 140, 143-145, 148, 150, 153, 164, 165)] • Improved quality of care[(5, 9, 37, 46, 50-52, 57, 59, 61, 64, 68-70, 73, 77, 83, 88, 89, 93, 97, 101-103, 105-107, 116, 118, 124, 129, 135, 143, 146, 148, 150-153)] • Improved care continuity[(5, 9, 37, 43, 46, 47, 52, 57, 64, 65, 69, 82, 84, 90, 92, 104, 132, 135, 148, 150, 155, 161, 163, 166)] • Use of telemedicine equipment for staff training [(12, 37, 41, 50, 59, 65, 68, 70, 79, 86, 103, 105, 106, 145, 155)] • Cost saving[&] [(8, 9, 25, 31, 34, 38, 43, 47, 50, 53, 56-59, 62, 64, 69-110)] • Reduced clinician isolation[(50, 70, 86, 103, 106)]	• Improved access to care[%][(5, 9, 22, 24, 26, 29, 30, 33, 37-39, 41-43, 47, 49, 50, 52, 56-59, 62, 64, 69, 70, 73-77, 81, 82, 87, 88, 90-93, 96, 97, 100-104, 107, 108, 110-112, 116, 118, 123, 124, 126, 127, 129, 131, 134, 136, 140, 143-145, 148, 150, 153, 164, 165)] • Improved quality of care[%] [(5, 9, 37, 46, 50-52, 57, 59, 61, 64, 68-70, 73, 77, 83, 88, 89, 93, 97, 101-103, 105-107, 116, 118, 124, 129, 135, 143, 146, 148, 150-153)] • Improved care continuity[%][(5, 9, 37, 43, 46, 47, 52, 57, 64, 65, 69, 82, 84, 90, 92, 104, 132, 135, 148, 150, 155, 161, 163, 166)]

		• *Reduced clinician burnout*[41, 65, 68] • *Opportunity to do research*[5, 9, 41, 72, 98]	• *Collaboration with hospital specialists* [37, 50, 64, 71, 72, 105, 106] • *Upskilling of prison healthcare staff in disease management*[12, 24, 30, 37, 50, 51, 61, 64, 68, 70, 72, 99, 103, 105, 106, 118, 134, 145, 154, 156] • *Increase in prison prescribing of specialist medications*[24] • *Reduced hospital admissions & emergency attendances*[8, 37, 65, 93, 97, 144] • *Opportunity for more multi-disciplinary care*[30, 37, 41, 52, 59, 64, 69, 72, 74, 83, 102, 103, 105, 107, 114, 115, 123, 134, 145, 157-159]	• *Reduced patient stigma*[5, 9, 39, 59, 71, 72, 83, 84, 105, 106, 109, 110, 122, 123] • *Some patients able to have tele-consultation alone, improving disclosure*[85] • *Reduced need to travel long distances under escort*[71, 104, 109, 131]
Perceived Barriers prior to implementation	• Cost[70] • Healthcare secondary to prison regime[12, 66, 120]	• Altered Dr-patient relationship[12, 41, 114, 142] • Compromised quality of care[12, 38, 41, 60, 75, 137, 143] • Lack of technological expertise[129] • Self-conscious on 'tv'[41] • Reimbursement [75] • Unsure whether patient referred appropriately or simply to save costs[7] • Technological limitations[114, 129]	• Lack of technological expertise[129] • Data security[12, 114] • Confidentiality of consultation[12, 129] • Compromised quality of care[112] • Loss of staff autonomy[53]	• Patient not interested in seeking healthcare treatment[114]
Actual barriers during implementation	• Cost of clinic set up/technology[5, 37, 48, 50, 57, 59, 64, 65, 70, 72, 101, 104, 139, 149, 159] * • *Time to recoup cost of equipment*[72, 80, 149]* • *Increased costs due to increased healthcare appointments** [24, 96] • *Bureaucracy* [12, 53, 152] • *Remand/high turnover*[118, 124] • *Hard to generate meaningful effectiveness data*[65] • *Health services outside prison jurisdiction*[53] • *State communications infrastructure*[70, 95, 104]	• Technological[9, 37, 53, 59, 64, 65, 69, 77, 112, 115, 139, 143, 146, 159, 167] • Staff acceptance[9, 12, 50, 53, 57, 59, 69, 70, 72, 85, 86, 93, 101, 104, 115, 118, 120, 139, 143, 144, 149, 151, 159, 160] • Clinical compatibility – some specialties not suitable, missed clinical cues[9, 12, 34, 37, 50, 62, 65, 69, 70, 72, 77, 83, 86, 88, 93, 99, 104, 110, 112, 115, 118, 120, 129, 130, 135, 139, 140, 143, 146, 149, 153, 168] • *Restriction to practicing across state boundaries*[59, 65, 78, 98, 101, 120, 135, 139, 160] • *Financial savings not realised by hospitals*[34, 86] • *Lack of clinical guidelines for telemedicine use*[9, 12, 143] • *Wariness of providing care over a link owned and operationalised by the correctional system*[143] • *Cost of clinic set up/technology*[159] • Reimbursement difficulties[83, 98, 101] • *Fear of litigation*[37, 58, 65, 78, 98, 101, 135] • *Concerns over care if equipment fails*[37, 120, 139] • *Receipt of informed consent*[59, 64, 120, 139, 143, 149] • *Concern over patient lack of confidentiality*[65, 98, 120, 135, 149] • *Concern of inability to intervene if patient self harms*[149]	• Technological [9, 39, 46, 53, 64, 66, 70, 95, 104, 115, 130, 146, 159] • Staff acceptance[53, 57, 59, 65, 66, 83, 86, 88, 101, 112, 130, 144, 159] • *Increased admin workload (coordinating appointments, sending notes)*[9, 24, 100, 112, 116] • *Demand underestimated*[24, 38, 65, 73] • *Some patients unsuitable for telemedicine medium*[146] • *Admin staff not willing to terminate existing consultant contracts in case telemedicine doesn't work*[88, 93] • *Cost of equipment/clinic set up*[12, 118, 159] • *Time taken to recoup cost of equipment*[50, 72, 159] • *Lack of private space for consultation*[70, 118] • *Fear of litigation*[135] • *Scheduling suitable clinics*[100] • *Lack of staff resource for implementation*[98, 169] • *Difficulties transporting patient to appointment*[66, 94, 99]	• *Patient distrust/nervous*[70, 71, 115, 121, 146, 156] • *Some patients unsuitable for telemedicine medium*[146] • *Lack of patient privacy*[37, 65, 69, 73, 83, 120, 129, 142] • *Preference for in-person consultations*[65, 112, 115] • Patient chooses not to have healthcare[118]

		• *Lack of referrals*[6] • *Staff availability*[99, 144]		
Common barriers to all	• Complexity of multiple providers [8, 9, 54, 72] • Lack of alignment with organisational goals/current priorities[12, 54, 72, 143, 144, 146] • Readjustment to new work practices [130] • Lack of leadership[144] • Isolated telemedicine projects – unaligned with other models/routine healthcare[9] • Information governance[37, 69, 120, 139] • Early engagement on anticipated problems/concerns[65]			
Enablers to use	• Staff training on model[73] • Sustainable/state supported costs[25, 38, 71, 95, 99, 123, 159] • Leadership and support[66]	• Involving staff in model development[124] • Telemedicine champions[65, 101, 124] • Prison staff trained to operate peripherals/assist consultation[29, 37, 39-41, 51, 65, 72, 75, 78, 80, 83, 94, 99, 107, 110, 112, 115, 118, 134, 144, 153, 163, 164] • Staff understand intervention and reason for its implementation[34, 65, 146] • Staff training in technology use[5, 80, 83, 89, 112, 115, 120, 139, 147, 149] • Electronic health records accessible by hospital clinicians[5, 64, 65, 74, 81, 85, 104, 112, 122-124, 137, 153, 164] • Upon use - Improved clinician acceptance with continued use[93, 99, 110] • Appropriate peripherals[5, 25, 39, 40, 48, 51, 62, 72, 74, 78, 80, 89, 94, 99, 101, 102, 112, 118, 133, 137, 144, 153, 158, 164, 170] • Technology fit for purpose including adequate visual & audio quality, camera alignment[5, 8, 38, 40, 41, 62, 71, 72, 74, 81, 83, 85, 89, 99, 101, 102, 104, 105, 110, 112, 115, 117, 118, 139, 146, 147, 149, 167] • Dedicated telemedicine practitioners[5, 6, 41, 49, 65, 102, 144, 148, 169] • University hospital open to research and innovation[69, 79, 103, 165] • Dedicated telemedicine clinic slots[41, 60, 65, 71, 73, 76, 80, 84, 85, 104, 107, 112, 170] • Review of healthcare records in advance of appointment[39-41, 65, 83, 91, 120, 122, 153] • Staff spent time in prison to understand context[65, 104] • Good relationship between prison and hospital clinicians[38, 74, 86, 99] • Licensing for practice straightforward[37, 65, 118, 143]	• Involving staff in model development[34, 146] • Telemedicine champions[5, 9, 66, 95, 100, 101, 124] • Staff understand intervention and reason for its implementation[12, 34, 65, 67, 73, 89, 130, 146] • Staff training in technology use and troubleshooting[5, 9, 73, 89, 112, 113, 115, 118, 120, 134, 144, 145, 169] • In person visits to operational telemedicine models[144] • Equipment easy to use[85] • Upon use - Improved clinician acceptance with continued use[93, 99, 110] • Training sessions with hospital clinicians to support consultation and upskill staff[51, 67, 158] • Technology fit for purpose including adequate visual & audio quality, camera alignment(5, 8, 38, 40, 41, 62, 71, 72, 74, 81, 83, 85, 89, 99, 101, 102, 104, 105, 110, 112, 115, 117, 118, 139, 146, 147, 149, 167) • Backup plan for care provision if technology fails[139] • Secure data transfer[64] • IT support[66, 112] • Private rooms, preferably dedicated to telemedicine[5, 38, 39, 41, 65, 73, 85, 88, 115, 164] • Dedicated telemedicine coordinators[41, 73, 78, 80, 86, 88, 89, 93, 104, 115, 130, 158] • Dedicated telemedicine clinic slots[41, 60, 65, 71, 73, 76, 80, 84, 85, 104, 107, 112, 170] • Patient finds telemedicine acceptable/preferable[8, 12, 58, 60, 62, 64, 65, 71-73, 80, 82, 83, 85, 88, 93-95, 99, 104, 105, 111-121] • Referral and use clear[38, 39, 41, 50, 65, 67, 71, 112, 124, 144, 152, 153, 165]	• Explanation of telemedicine process and completion of informed consent form to address patient concerns/worries[12, 41, 146] • Patient finds telemedicine acceptable/preferable[8, 12, 58, 60, 62, 64, 65, 71-73, 80, 82, 83, 85, 88, 93-95, 99, 104, 105, 111-121] • Patients used to video medium for parole hearings and therefore happy to disclose over telemedicine[111] • Patient has existing trusted relationship with prison healthcare staff[60, 118, 130, 155] • Technology of adequate visual & audio quality, camera alignment[83, 121, 167] • Younger patients comfortable with technology use[114] • Patient likes interpersonal distance from telemedicine[98, 111]

			• Model used for other purposes e.g. staff training[9, 65, 70, 99, 112, 120] • Good relationship between prison and hospital clinicians[38, 74, 86, 99]	
Enablers common to all non-patient groups	Multidisciplinary implementation teams[8, 9, 74, 88, 89, 99, 112, 146, 157] Formal needs assessment to support implementation[72, 89, 93] Formalised working relationships which at initiation rely on goodwill and enthusiasm[86, 143] Equipment and management plans developed with input of prison and hospital staff to ensure it is fit for both provider purpose Promotion and encouragement of change management[116] Senior buy in and commitment[12, 37, 59, 116, 143] Integrated prison/hospital consultant commissioning/provider[98, 99, 124, 128, 130, 157]			
Table footnotes	*seen as a barrier if correctional system itself is delivering the prison healthcare as opposed to commissioned provider £benefits and barriers to patients are seldom reported by patients/through data collected from patients, and are most frequently reported on behalf of staff views of the patient experience $ anticipated benefits at outset, of access and quality of care were often shared by correctional system/prison healthcare providers. For example, in the USA the correctional system is responsible for provision of healthcare. It was not possible from the information provided in the literature retrieved to discern if only one party perceived this as a potential benefit. % No literature retrieved asked patients what benefits they anticipated prior to telemedicine introductions, therefore anticipated benefits for patients are reported as per the opinions of other parties at outset &beneficiaries of cost savings are dependent on the commissioning arrangement for prison healthcare. The USA is the most prolific publisher of prison telemedicine literature and is responsible for provision of healthcare services, therefore cost savings are attributed to the correctional system but related to prison healthcare. Therefore separation of cost savings by prison healthcare and the correctional system is not possible in most instances. Where it is not possible to distinguish between correctional and prison healthcare savings these references have been cited for both parties.			

Figure 1: PRISMA flow diagram

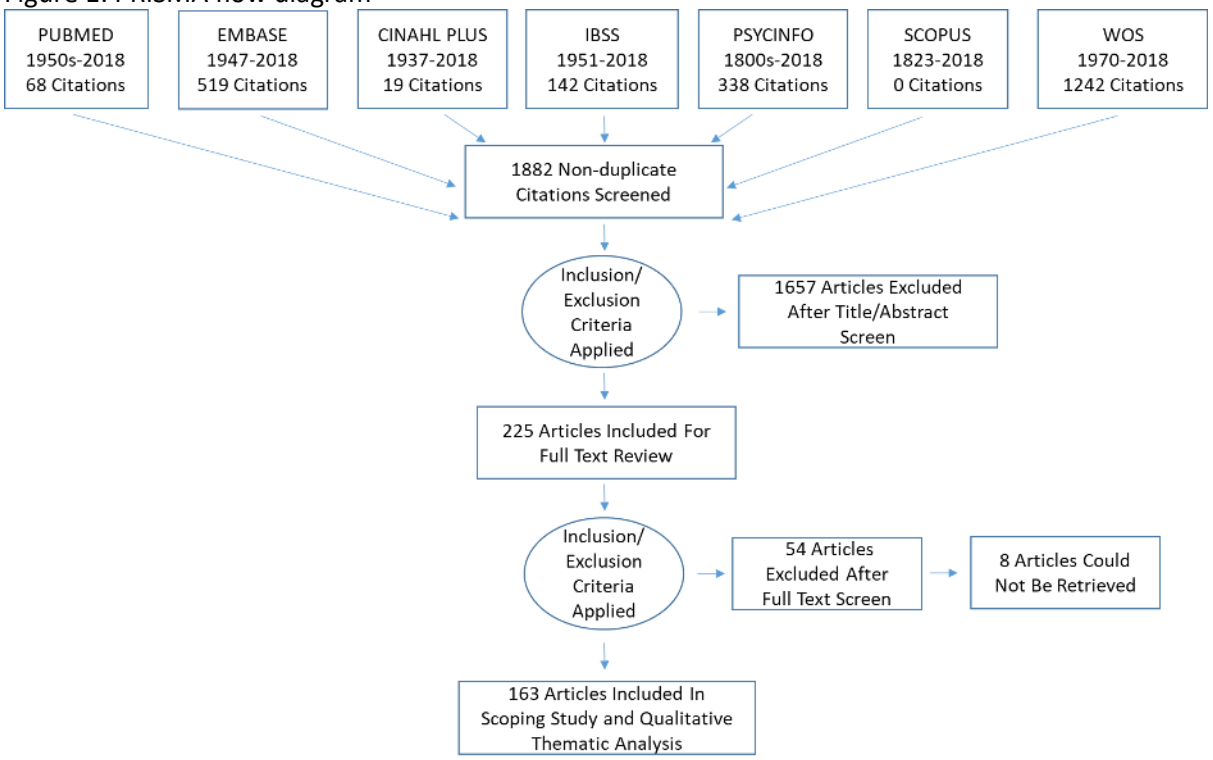


Figure 2: Number of publications on prison telemedicine by country

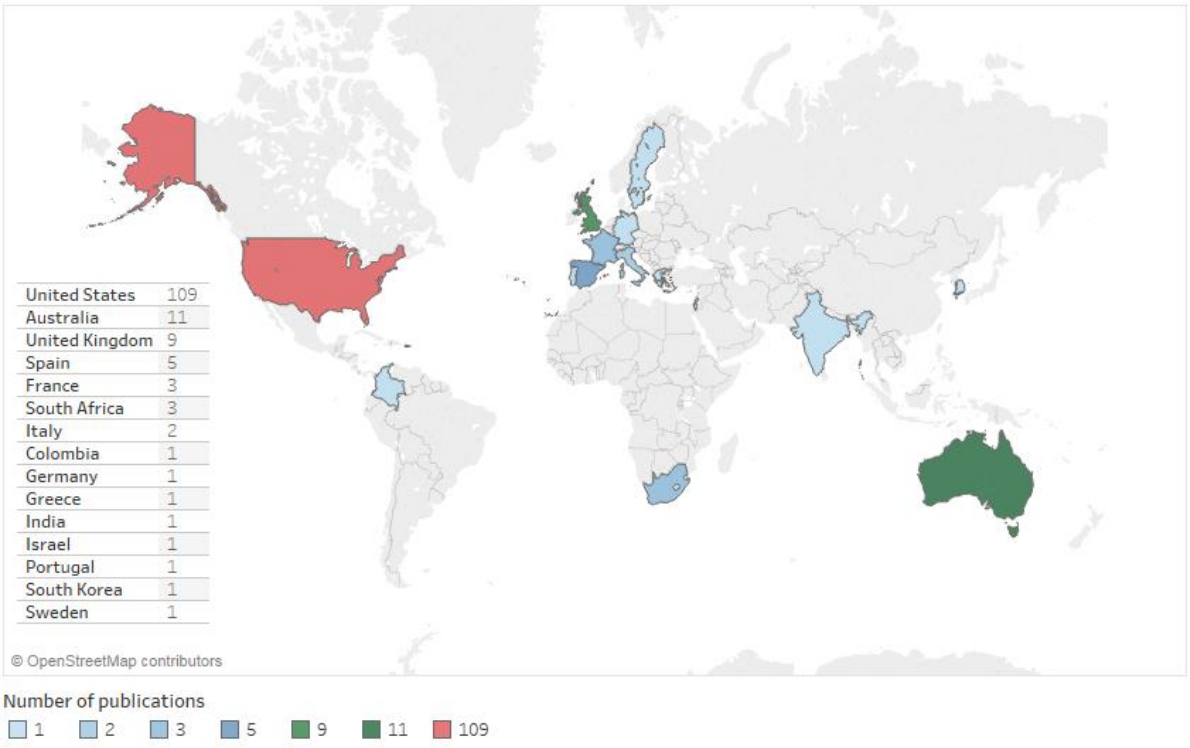


Figure 3: Layers of context influencing prison telemedicine implementation

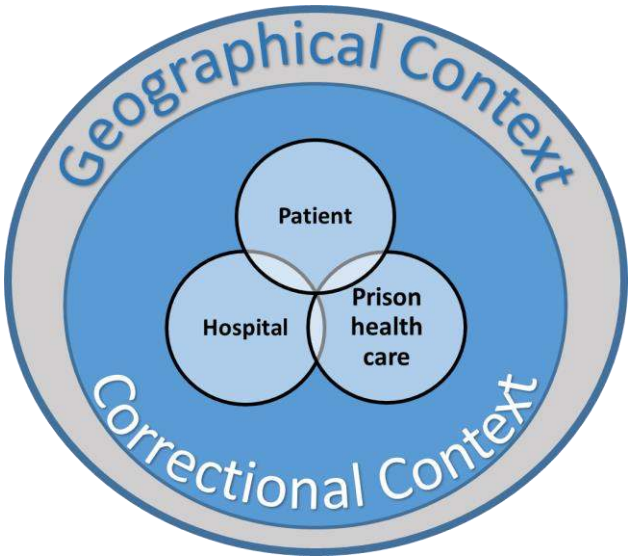


Figure 4: Checklist for prison telemedicine implementation

The Connection
Is there sufficient bandwidth to provide a reliable internet connection?(64, 69, 70, 104, 139, 159)
Is the connection encrypted and secure?(159)
Will prison firewalls need to be breached to secure connection with outside providers?(64)

The System Equipment
Will the system provide adequate audio and visual outputs?(37, 64, 115, 167)
Does the system need to be mobile to allow greater flexibility of use (acknowledging potential increase in costs and incumbent security issues)?(39)
Where will cameras be placed to provide optimal visuals for consultation?(37, 64)
Does the clinician need to be able to remotely control the camera movement?(39)
Are peripherals required?(40, 48, 102, 112, 158)
Are required peripherals reliable and easy to use?(112)

Training and Troubleshooting
Has a full system check been scheduled prior to operation of the telemedicine system?(66, 130)
Who will provide staff training on equipment use and troubleshooting?(146)
Who will be responsible for equipment maintenance/technical support and at what intervals?(66, 143, 146)
Is a clear backup plan available for care provision in the event of equipment failure?(65, 120)

Supplementary Material

Systematic search terms

A title-abstract search was performed on all databases, with relevant MeSH terms used when appropriate. Searches were based on terms for ‘prison’ AND ‘telemedicine’ which were developed with input from an experienced librarian and review of similar article search terminology. The following search terms were adopted for the database searches (table Supp1)

Supplementary Table 1: Prison telemedicine systematic search terms

Database	Prisons search terms	Telemedicine search terms
Embase MeSH (exploded terms)	Prison, prison nursing, prisoner, offender, detention camp	telemedicine
Pubmed MeSH (exploded terms)	Prison, prisoners	telemedicine
Psycinfo MeSH (exploded terms)	Prisons, Incarceration, prisoners	telemedicine
CINAHL major concepts	Prisoners, correctional facilities, correctional health nursing, correctional health services	Telemedicine, telerehabilitation, telepsychiatry, telehealth, teleradiology, telepathology, telenursing, remote consultation
IBSS keyword	Prison*	telemedicine
Text word searches for all databases, SCOPUS title-abstract-keywords, WoS topics	prison* OR inmate* OR jail* OR gaol* OR correction* facilit* OR penitentiar* OR penal institut* OR detention camp* OR custod* OR incarcerate* OR imprison* OR correctional setting* OR detain* OR detention* OR correction* centre* OR compulsory drug detention OR compulsory drug detention OR compulsory drug treatment OR compulsory rehabil OR re-education through labor OR laojiaosuo OR long-term detention OR labor camp*	telemedicine OR tele* OR telehealth OR telerehabilitation OR teleradiology OR telepathology OR remote consultation* OR teleconsultation* OR telepsych* OR telenursing OR telecardiology OR teledermatology OR telediagnosis OR telemonitoring OR teleradiotherapy OR teletherapy OR telesurger* OR telerheumatology OR teleneurophysiology OR teleobstetrics OR teleopthamology

All references returned were subject to title-abstract screening by two independent reviewers for inclusion in the scoping study and subsequent qualitative analysis. Any disagreements were resolved via discussion or with the assistance of a third reviewer. The following inclusion and exclusion criteria were applied.

Inclusion criteria

To be eligible for inclusion within this review the article must report information regarding the use of/advocacy for video teleconferencing for healthcare consultations (telemedicine) for people residing within a secure correctional facility hereafter termed a prison. No restriction was be placed on age, gender or geographical location of participants/participating prisons. No restriction was placed on date of publication as factors such as staff attitude reported in older studies may remain valid barriers/enablers in today's context.

Exclusion criteria

Patient population under study/report not set in a correctional setting, not in English language, telehealth not video conferencing, Use of remote monitoring by telehealth technologies only will not be eligible for inclusion. Only English language papers will be included for review.

Articles reporting empirical research were not excluded from inclusion in the qualitative review based on study bias. Excluding literature based on study methodology may have inadvertently excluded relevant information on barriers/enablers to implementation or local support and enthusiasm for telemedicine and therefore authors felt it was important to report contextual information from within these reports. Similarly grey literature was eligible for inclusion in the review. This is in line with traditional scoping review methodology that seeks to report breadth as opposed to weight of knowledge.

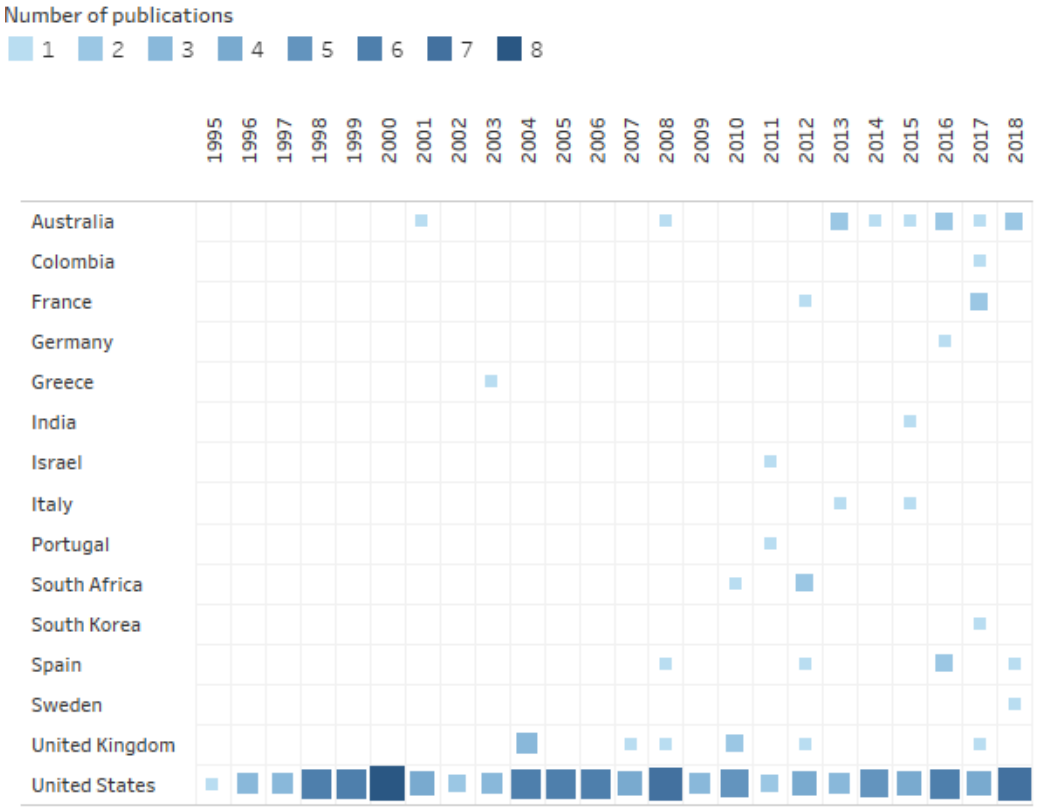
Supplementary Table 2: Cited telemedicine specialties and associated peripherals

Specialty	Peripherals	Number of times specialty is referenced within literature	References within literature to specialty
General telemedicine	Otoscope(74, 94, 99, 164, 170), stethoscope(74, 94, 99, 112, 144, 164, 170)	49	(5, 8, 9, 25, 34, 47, 49, 50, 53, 59, 60, 62, 70-

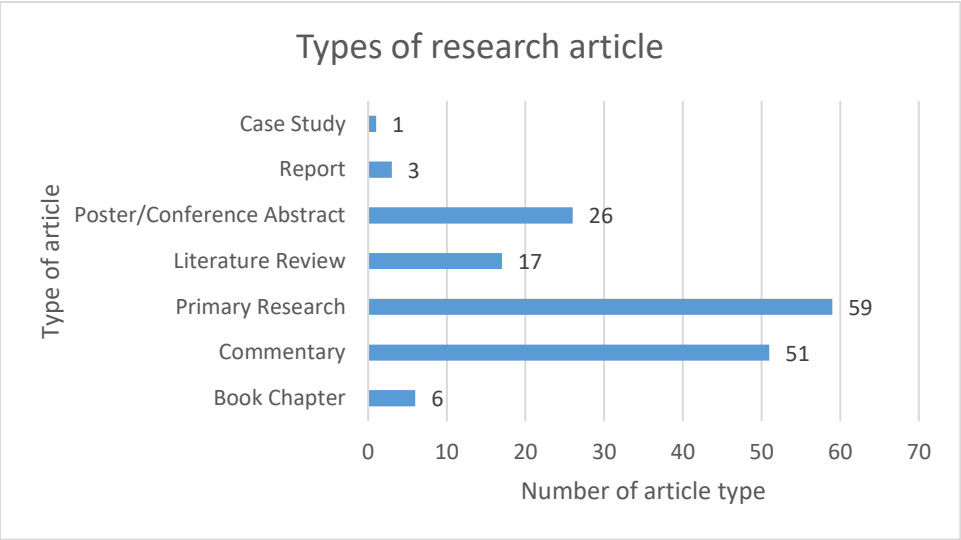
	ophthalmoscopes(74, 80, 94, 99, 164), ECG that integrates with telecommunications device (94, 164) Digital pulse oximetry(94, 164) Micro/intraoral cameras(101)		72, 79-82, 88, 89, 92, 94-97, 99, 101, 106, 108-110, 112, 116, 123-125, 130, 131, 136-138, 141, 144, 160, 162, 164, 171, 172)
Psychiatry		42	(7, 9, 12, 37, 38, 54, 58-60, 62, 64-66, 70, 73, 83, 85, 87, 88, 90, 98, 101, 104, 111, 113, 117, 119, 120, 129, 130, 135, 139, 142, 143, 148-151, 157, 167, 173, 174)
Hepatitis	Fibroscan(158)	25	(6, 29-33, 35, 36, 61, 67, 103, 121, 122, 145, 152, 154, 155, 158, 165, 175-181)
HIV	stethoscope(51, 102) dermal & oral lens(51)	15	(51, 52, 55, 62, 70, 74, 84, 100, 102, 128, 159, 163, 170, 182, 183)
Cardiology	stethoscope, ECG(48, 62)	13	(9, 48, 59, 60, 72, 80, 88, 99, 101, 130, 134, 162, 169)
Dermatology	Hand held camera(62)	13	(9, 59, 60, 62, 70, 72, 77, 88, 99, 101, 112, 130, 132, 140)
Musculoskeletal/orthopaedics		12	(9, 59, 60, 70, 72, 88, 99, 101, 110, 112, 130, 162)
Urology		9	(42, 56, 60, 72, 75, 76, 99, 124, 130)
Psychology		8	(41, 62, 63, 69, 70, 115, 146, 184)
Gastroenterology		6	(60, 72, 88, 99, 124, 130)
Neurology		6	(60, 62, 88, 99, 101, 130)
Infectious disease (general)		5	(9, 88, 99, 124, 130)
Internal medicine		4	(59, 72, 101, 130)
Ob-Gyn		4	(59, 86, 101, 162)
Emergency medicine		4	(39, 70, 133, 168)
Pulmonary medicine		4	(60, 88, 99, 130)
ENT	otoscope and laryngoscope(62, 94)	4	(62, 72, 88, 99)
Cancer		3	(60, 105, 162)
opthalmology	ophthalmoscopes(99)	3	(59, 99, 162)
dialysis	Dialysis equipment	2	(70, 162)
Dietary consultations		2	(70, 88)
Diabetes	Glucose monitor(153)	2	(9, 153)

colposcopy		2	(86, 162)
ECG		2	(9, 162)
Max-fax	intraoral camera, document scanner to view x-rays, stethoscope(78)	1	(78)
colonoscopy		1	(162)
Plastic surgery		1	(60)
Haemotology		1	(99)
Rheumatology		1	(99)
addictions		1	(9)
Wound care	Hand held camera(62)	1	(62)
Monitoring of botulinism		1	(185)

Supplementary Figure 1: Number of publications on prison telemedicine by year by country



Supplementary Figure 2: Types of research article in the final selection of literature included in review (n=163)



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