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Hepatitis C virus (HCV) screening in people who inject drugs (PWID) and prisoners — A narrative review of extant literature

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Summary

Background. Injecting drug use (IDU) is the major driver of Hepatitis C Virus (HCV) infection in European and other developed countries. People who inject drugs (PWID) and prisoners, both marginalised and underserved populations are recognised as key groups to target for HCV screening and treatment. **Aim:** To review the most up to date published literature on HCV screening in PWID and prisoners. **Methods:** Electronic data base (Medline, PubMed, Cochrane library and Embase) and relevant website search using key search terms related to the topic. **Results:** Data on HCV screening in these two groups is incomplete. Over half of PWID and a quarter of prisoners globally have been exposed to HCV. Multiple personal and institutional barriers, including; lack of knowledge, fear, stigma, complex testing procedures and competing priorities, have been identified to the upscaling of screening in these two groups. Focussed screening at targeted locations, increasing screening methods including the use of dried blood spot testing (DBS), peer-worker involvement and opt-out screening in prisons has the potential to enable uptake. Reflex-RNA testing streamlines identification of active infection and improves linkage to care. Supporting community linkage on prison release is critical to optimise HCV management. Active case finding in PWID and prisoners, provided within an ethical and human rights framework, increases diagnosis, assessment, and treatment, reduces transmission and is cost-effective. **Conclusion:** Optimising HCV screening in PWID and prisoners underpins any public and prison health strategy aimed at HCV elimination but requires political will and targeted resources to be successfully implemented.

Key Words: Prisoners; HCV; PWID; Screening

1. Introduction

Global HCV related morbidity and mortality continues to increase [22, 64]. HCV infection is mainly a disease of poor and marginalised people with the majority of those infected unaware of their status and not linked with traditional medical services [17, 53].

Many of those infected are diagnosed years after the initial exposure and often when symptomatic for advanced liver disease [17, 22, 53, 64, 78]. Late diagnosis of HCV infection is associated with poor outcomes and with increased risk of onward transmission [64, 78]. The diagnosis of HCV infection can be associated with a positive change in drug and risk-taking behaviour and can identify patients who can be linked with treatment [12].

Screening for HCV infection is based on detection of anti-HCV antibodies by enzyme immunoassay and confirmation of active disease by Nucleic Acid Test (NAT) for HCV RNA [34]. Both tests are widely available as validated commercial assays and can be laboratory or point of care (POC) based. Genotyping is usually carried out following sequencing of the 5' untranslated region (5'UTR) of the non-structural protein 5B (NS5B) region of the HCV genome [34].

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In low and middle incomes countries, the main route of HCV transmission is iatrogenic while in high income countries, the highest prevalence of infection occurs among people who inject drugs [78]. They also contribute not insignificantly to HCV transmission in developing countries [78]. More recently an increasing prevalence of HCV infection has been identified in HIV positive men who have sex with men (MSM) [11].

PWID include those who have ever injected an illicit drug. This population consists of both past injectors and "recent" injectors (with definitions for "recent" varying in the literature from 1 month to 1 year) [43]. A subgroup of PWID will also be receiving agonist opioid treatment (AOT), some of whom will continue to inject drugs [43].

In the literature PWID and prisoners are often reported as two separate groups [43, 44]. This separation is artificial because HCV infected prison populations are mainly a sub-group of the PWID population (past and present injectors) [44, 80].

The ongoing criminalisation of drug users ensures PWID experience high incarceration rates (56-90% ever being incarcerated) and previous incarceration is associated frequently with HCV infection and increased injecting risk in the community [75, 80]. This group move between community and prison with continued exposure to risk factors and often experiencing similar barriers to HCV screening and treatment in both settings [4, 66, 75, 80].

Recent prison release is also associated with heightened transmission risk [65]. Transitioning from prison to community is identified as high risk and seen as crucial to understanding HCV transmission and linkage to care in the community [15, 65]. This is the rationale for including both groups in this literature review.

Despite PWID and prisoners being identified as groups at high risk of HCV infection, screening rates remain low, with most unaware of their status [25, 48, 80]. PWID experience many barriers, including stigma, to engaging in traditional medical services [66]. Only half of the infected PWID in the USA and the UK are diagnosed [48]. High prevalence in this cohort, coupled with low awareness of infection, contributes to further transmission [48, 49].

Despite having access to health care while in prison, the majority of prisoners do not access HCV screening or treatment services [25, 60]. In many countries prison HCV screening programs are sporadic and incomplete [24, 42, 44, 60, 80]. In the US, 75% of state prisons offer no screening or targeted screening based on disclosed risk behaviour [42]. In many countries, prisoners constitute a considerable gap in the tested population [25, 44].

Recent developments in HCV management are reflected in a discourse of optimism for those infected. The management of HCV infection has evolved considerably in the past five years with the development of non-interferon based direct acting anti-virals (DAA) [28]. These therapies have meant a significant reduction in treatment duration; adverse side effects experienced by patients and significantly improved treatment outcomes for all genotypes [28, 33].

The review encompasses HCV incidence, prevalence and screening in both PWID and prisoners. The screening component includes barriers and enablers, guidelines, interventions/models designed to increase uptake, outcomes and cost-effectiveness.

2. Methods

A narrative review of the literature was undertaken. The search engines Medline, PubMed, the Cochrane Library and Embase were searched for all articles published in the time frame 2008-2018 in all languages. Key search terms used were prison, prisoner, inmate combined with Hepatitis C and a range of other terms relevant to HCV case finding, including incidence, prevalence, screening and cost-effectiveness. The same search was repeating replacing prisoner with PWID.

Due to the recent advances in HCV management, preference was given to systematic reviews, articles published in the last 5 years and in high impact peer reviewed journals. The reference lists of the chosen publications were also searched for additional articles that might be relevant to the review. Websites from the following organisations; United Nations Office on Drugs and Crime (UNDOC), World Health Organisation (WHO), European Centre for Disease Prevention and Control (ECDC), European Monitoring Centre for Drugs and Drug Addiction (EMCDDA) and Centre for Disease Control and Prevention (CDC). Reference lists from these reports were searched for additional articles relevant to this review. Grey and unpublished literature was not included.

The term prison is used in this review to encompass all places of detention associated with the criminal justice system, including prisons, remand centres (prisoners awaiting trial) and the American term jail (prisoners on remand and serving sentences of less than one year), juvenile detention facilities, pre-trial detention centres and extra-judicial detention centres

for PWID.

3. Results

3.1. Epidemiology of HCV among PWID and prisoners

There are large deficits in information regarding HCV infection and its management in most jurisdictions [22, 53]. This deficit in surveillance is even greater among PWID and prison populations [25, 44, 71].

There is much regional variation in prevalence, but it is estimated that 65% of PWID (> 10 million people) have been infected with HCV [25]. Across Europe the prevalence of anti-HCV among PWID ranges from 15%-84%, with an average almost 50 times higher than the general population [27, 35]. Similar high anti-HCV prevalence rates among PWID are reported in Australia and USA [32, 48].

Since PWID are over represented in prison populations, there is a much higher HCV prevalence rate in prisoners than in the general population [44, 71]. A 2008 review found a chronic HCV prevalence of 16%-49% in prison populations globally [71]. This review of 30 HCV prison- based seroprevalence studies in 14 countries reported that most countries had an anti-HCV prevalence of between 30-40% and found that prisoners with a history of IDU were approximately 24 times more likely than non-IDU to have been exposed to HCV [71]. The odds ratio of being anti- HCV positive was three times higher for inmates exposed to tattooing than those not exposed [71].

A more recent 2013 systematic review and meta-analysis of the incidence and prevalence of HCV infection in prison and closed settings found an HCV incidence among general detainees of 1.4 per 100-person years and 16.4 per 100-person years in detainees with a history of IDU [44]. This review reports a summary HCV prevalence estimate for general detainees of 26%, increasing to 64% in those with a history of IDU [44].

There are marked regional variations in HCV prevalence estimates among prisoners. The lowest rates are found in the Middle East and North Africa (3%) with the highest rates found in Central Asia (38%) [44]. Studies reporting on HCV prevalence in prisoners with a history of IDU found lower rates of infection in Latin American countries (23%) and highest in Western Europe (73%) (Larney et al. 2013). There are an estimated 2.2 million detainees globally infected with HCV with the largest numbers being in North America (668,500) and East and South East Asia (638,000) [44]. According to a review on the global burden of communicable diseases among people in prison, the HCV prevalence in Western Europe was estimated at 15.5% (12.2-19.1). When considering only prisoners with a history of IDU, national HCV estimates were largely above 40% [25].

There are large parts of the world where no prevalence data is available such as Russia and its former states [44]. There is also very limited data on involuntary detainees (2 studies) [50, 74].

While many studies have reported on anti-HCV prevalence among prison and PWID populations [32, 44], only a handful have reported on rates of chronic infection [47, 52, 72]. A number of studies report chronic HCV prevalence in subgroups e.g. cohorts being targeted for treatment or committal prisoners, but these study designs do not allow for accurate population estimates [47, 52].

It is important that these types of studies are conducted since chronic infection is the only reliable indicator of the levels of infection in a population [17]. If we continue to rely on anti-HCV prevalence studies, we will miss the impact of treatment and will not have accurate indicators for re-infection rates among those treated [60].

It is also important that incidence and prevalence studies are up to date and representative of the population being studied, since older studies and those using convenience sampling report higher anti-HCV prevalence rates than newer randomised studies [44, 60]. Understanding and quantifying the level of HCV related liver disease is crucial to inform HCV treatment policy and strategy.

3.2. Screening approaches and guidelines

Many international guidelines on PWID and prisoner health recognise the high HCV prevalence and low levels of HCV diagnosis, and recommend that HCV screening and treatment be made an integral part of health care systems where these patients attend [1, 24, 77].

Two approaches are taken in high-income countries to expand HCV testing. The first is to specify the risk groups for testing. Targeted testing of persons belonging to risk groups and those with high HCV prevalence is likely to increase the number of HCV-infected people identified and referred for assessment and treatment [24, 77]. Risk group identification is challenging because many individuals do not wish to acknowledge behaviours that are stigmatising [42,

77]. The second approach used is to define demographic groups using age criteria. An example of this approach is birth-cohort testing in the USA [62].

WHO guidelines recommend the offering of HCV serology testing to individuals who are part of a population with high HCV prevalence or who have a history of HCV risk exposure/behaviour [77]. This includes both PWID and prisoners. International recommendations also advise repeat screening in individuals with ongoing risk of re-infection, including after spontaneous clearance or successful treatment [21, 77].

The 2003 Centre for Disease Control (CDC) guidelines recommended the HCV screening of prisoners on a risk basis [3]. The CDC revised their guidance in 2013 to include all prisoners falling into the baby boomer age cohort (1945-1965) [21]. This cohort are at low risk of onward transmission, but at high risk of developing HCV related liver disease given the length of time they have the infection [62]. The US Preventive Task Force recommends that a history of incarceration should trigger HCV screening in the community [30].

Despite these recommendations and evidence that, when made available, HCV screening and treatment can be safely and successfully provided in prison settings, often prisoners return to their communities post incarceration unaware of their HCV status and untreated [60].

3.3. Barriers and enablers

A number of qualitative studies have identified a broad and unique range of barriers and enablers to HCV screening in PWID and prisoners [9, 41, 66, 79].

The inability of PWID to access testing and treatment facilities and discrimination against this socially marginalised group have been identified as major barriers to care [66]. Systemic barriers identified include lack of consensus guidelines regarding who to screen and limited infrastructure, particularly in drug treatment centres and primary care [9]. Lack of knowledge and the asymptomatic nature of both the acute and chronic stages of the infection are also identified barriers [79].

In prisoners, personal and institutional barriers have been identified to explain low screening uptake [39, 40, 61]. These include prisoners' fears and lack of knowledge about HCV, lack of awareness about testing procedures, concerns about confidentiality and stigma, socioeconomics, substance use, mental health, unstable lifestyle, health beliefs and competing priorities [39, 61].

Institutional barriers include the organisation of testing procedures, inadequate pre- and post-test discussion, lack of appropriate approaches to offering testing, and lack of continuity of care on discharge and transfer [40, 61]. The cost of screening and more importantly the cost of treating those chronically infected is a further barrier to prisons actively pursuing a systematic approach to HCV screening [40].

In both these groups, most HCV testing is mainly performed through venepuncture, either on site or by referral. Venous access can be poor, requires specialist staff and if only available in hospital setting can further increase stigma [36].

A number of enablers to HCV screening uptake have been identified in both these groups. PWID are most likely to be successfully screened at locations where they are in contact with the health care system (on-site testing) [39, 81]. These include drug treatment clinics, emergency departments and general practices. Screening is further enhanced by having pre-test counselling and education available at these sites [8].

Low-threshold facilities can serve as an initial point of HCV testing, utilising point-of-care (POC) or non-invasive such as dried blood spot testings (DBS) antibody tests [8]. A number of studies have reported that offering transient elastography in low-threshold facilities has the potential to raise awareness of liver health and facilitate HCV testing and management [81].

A 2014 systematic review reported that the provision of support and training to GPs, the offering of DBS and the provision of testing through outreach programmes may increase uptake of HCV testing in targeted populations [40]. There is also evidence that media-based interventions are effective in increasing the uptake of testing, identifying HCV-infected persons and referring them to care [59].

Enablers to HCV screening in prisoners have been identified and these include in-reach hepatology services, improved models of health care delivery, increasing prisoners' awareness and understanding of HCV infection and treatment options, educating both operational and clinical staff and involvement of peer educators in increasing knowledge and reducing stigma [63, 73].

DBS is a non-invasive blood test and can be performed by clinical and non-clinical staff. It necessitates only a needle prick that requires minimal staff training. It is easy to perform in people with poor venous access so increasing opportunity for HCV

screening. Two UK studies showed that offering DBT within specialist addiction services and prisons led to a threefold to six-fold increase in HCV screening [45, 73].

Studies have shown that the use of oral POC tests in prisons have shown good uptake and acceptability and have demonstrated that these are cost-effective if followed up with treatment for those identified has having chronic HCV infection [55].

3.4. Opt-out screening

Many previous guidelines recommend HCV screening in prisons based on prisoner self-request or self-reported risk factors (opt-in) which are vastly underreported because of fear of self-incrimination and stigma [25, 42, 60]. Opt-out screening involves informing the prisoners that a HCV screen will be performed (usually as a suite of other blood tests) unless he/she opts-out or refuses testing [14, 42, 60]. This approach is already recommended by the CDC for HIV testing in incarcerated populations [26]. This approach has been shown to increase diagnosis, streamline screening procedures, reduce stigma, improve uptake in medical care and be cost-effective [26]. In the UK, opt-out screening is now the recommended approach to HCV screening in prisons [68]. It is vital that testing is voluntary, and that confidentiality be maintained as part of the approaches to enhance testing [46, 68].

3.5. Peer Support

Studies have shown that the use of peer workers in community-based HCV management has a positive impact on the uptake of services [58, 63]. Research shows high levels of satisfaction among service users and staff in community-based drug treatment clinics with this role [67].

There is further evidence to suggest that engagement in HCV care may be facilitated by the influence of peers who completed treatment [2]. The ETHOS Study in Australia reported a very strong positive response to peer workers by staff and service users which lead to improved access to services, a more client-friendly treatment environment and increased support to services users with assessment and engagement with HCV treatment [58].

A large 2016 systematic review (mainly qualitative studies) of peer education and support in prison settings found that peer education interventions are effective at reducing risk behaviour, acceptable within the prison environment and have a positive impact on prisoner wellbeing [31].

Peer workers have the ability to connect with other prisoners, reduce social stigma and impact positively with a vulnerable patient cohort who is traditionally resistant to professional advice [67]. There are also direct benefits for the peer workers themselves and benefits for the wider prison system including more effective use of resources and the ability to expand the range of prison-based health services available to inmates [2, 31]. The use of peer support workers in HCV assessment and prison-based health delivery initiatives is recognised in the literature as an effective facilitator to increase HCV screening uptake [2, 58].

The importance of peer to peer education is well recognised. Peer education has been adopted in health promotion in various settings because of its cost-effectiveness over professionally delivered services [4]. Furthermore, peers are seen by other prisoners as a credible source of information and have the potential to address the lack of HCV related knowledge and stigma reported among prison populations [4].

3.6. Ethical Issues

The United Nations and the European court of human rights are increasingly finding that issues related to HCV and harm reduction in detention can contribute to or even constitute conditions that meet the threshold of ill treatment [54, 70]. These include the inadequate prevention care or treatment of HCV, the denial of harm reduction series or conditions that aggravate and favour the transmission of these diseases [54, 70].

Prisoners are entitled to the equivalence of care and access to the highest attainable standard of physical and mental health [69]. The United Nations Basic Principles for the Treatment of Prisoners state that prisoners “shall have access to the health services available in the country without discrimination on the grounds of their legal situation" [10]. According to the WHO, national and regional governments should provide prisoners with the best possible healthcare free of charge, even in times of substantial economic difficulty [19].

Importantly, several ethical issues regarding HCV testing in prison have been raised. There is a need to ensure that HCV screening in prison is truly voluntary and not a result of coercion due to potentially unequal power relationships between prisoners and staff [46].

A recent court ruling in the USA ruled that prisons cannot ignore HCV disease in prisons and also that those identified as chronically infected should be provided with treatment [6]. These rulings could have a major impact on prison budgets and may reduce the appetite among prisons to screen for HCV.

3.7. Cost-effectiveness

Despite low PWID treatment rates, upscaling HCV screening can be cost-effective in drug treatment services and in prisons in high-income settings if continuity of treatment/care is ensured [29, 37]. The higher the treatment rates, the more cost-effective HCV screening becomes, as more of those identified as chronically infected will be treated having a greater impact on the general population [37].

As previously reported, DBS is an effective targeted intervention for increasing HCV screening among PWID and prisoners [63, 73]. Studies have shown that DBS testing in addiction services and prisons is cost-effective [29, 37].

Under the base-case assumption of no continuity of treatment/care when exiting/entering prison, DBS testing is not cost-effective in prison settings [37]. Increasing PWID treatment rates to those for ex-PWID considerably reduces ICER (£4500 and £30 000 per QALY gained for addiction services and prison, respectively). If continuity of care is >40%, the prison DBS ICER falls below £20 000 per QALY gained [37].

Economic evidence for screening populations is robust. If a cost per quality adjusted life year (QALY) of £30 000 is considered reasonable value for money, then screening birth cohorts, drug users and high-risk populations are cost-effective [37].

A 2016 American study using mathematical modelling found that universal opt-out screening in prisons is highly cost-effective and would reduce HCV transmission and HCV related morbidity and mortality both in prison and, in particular, in the community [37].

3.8. Prison Health Care Structures

There is huge variation globally in models of health care delivery which is often resource dependent. Prison health care systems reflect these variations and are further complicated by the competing needs of security [76].

With increasing global prison populations and disease epidemics, prison healthcare services have become increasingly complex. There is substantial regional variation in the quality, comprehensiveness and organisational infrastructure of health-care delivery [29, 76]. There is much consensus in the medical literature that lack of emphasis and resourcing into the management of prisoner health is a wasted public health opportunity [76].

The Committee of Ministers of the Council of Europe has urged for prison health to be integrated into and compatible with national health policy, stating that such integration is in the best interests of the population at large, particularly for policies relating to infectious diseases [18].

Many countries have linked prison health and public health services. In Norway, France and the UK, the delivery of prison healthcare is under the authority of the national public health department [23].

In the USA, where prison healthcare is overseen by both national and regional government, various healthcare delivery models are used [57]. These range from healthcare services being entirely run by prison staff to those in which contractual relations are established with outside healthcare providers [57]. In some prison systems, academic medical centers play an important role in healthcare delivery, with evidence of improved outcomes [57].

Poor integration between prison and public health systems results in poor continuity of care for individuals transitioning to the community after release from prison [7]. Such fragmentation of care affects prisoners with various disorders, such as HIV, mental illness, diabetes and asthma, and can result in delayed treatment and costly use of health care [7].

Jurisdictions in which healthcare is delivered under the auspices of correctional authorities face the essentially intrinsic conflict between custodial and healthcare priorities, whereas settings where healthcare is delivered by separate health agencies face the challenge of dealing with dual bureaucracies [29, 76].

3.9. Moving between prison and community

Studies in Europe, Australia, and the USA have shown that inmates have a higher mortality after their release from prison [13, 16, 51]. The transition back to the community from prison is a stressful period, as released prisoners attempt to secure housing and employment and to re-connect with family. In many cases they have to cope with substance use and mental health disorders. During this transitional period, they are especially likely to engage in high-risk sexual activities and illicit substance use [13, 15, 16].

Because many PWID are incarcerated for relatively brief periods (on average 4 months in the UK), it is crucial to ensure that infected individuals are referred to treatment and remain in referral contact or on treatment after release or transfer [5]. Those not treated while in prison can be referred to care in clinical or community settings when released [5].

As previously reported the cost-effectiveness and benefits of enhanced prison screening is dependent on treatment follow up on release [19, 37, 48].

4. Discussion

HCV infection is now a curable and preventable epidemic, but major challenges exist to engaging those most at risk of infection with screening and treatment services [39, 41]. Despite HCV incidence and prevalence being much higher in PWID and prisoners than the general population, there are substantial deficits in HCV surveillance in most jurisdictions in these two groups [20, 22, 38, 44, 56]. This impacts the planning and implementation of national HCV strategies.

Increasing HCV surveillance, in particular data on transmission risks, the prevalence of untreated chronic HCV infection and incident infection, is crucial to inform HCV management and prevention strategies, policy makers and budget holders.

Removing identified barriers to HCV screening is the first step in tackling the HCV epidemic. Focusing screening efforts to locations where high-risk populations attend (drug treatment services and prisons) will have the greatest impact [25, 81]. Providing a range of screening methods including venepuncture, POC oral and DBS testing will maximise uptake and allow for HCV screening provision across a range of locations, including those staffed by non-clinical personnel [55, 81].

Consideration needs to be given to simplifying testing regimes including reflex testing of all samples shown to be anti-HCV positive [24]. The requirement for testing for other drug related blood borne viral (BBV) infections may determine the most suitable type of screening required. It is important that services communicate with each other to avoid unnecessary testing and to prevent missed opportunities to progress patients along the HCV treatment-cascade. This is of particular importance when patients enter and exit prisons [5, 8, 39, 65].

Prison offers an opportunity to engage a subset of PWID that are difficult to engage in other locations [42]. Maximising this public health opportunity is crucial. Opt-out screening on committal increases uptake and avoids prisoners having to declare a history of IDU [55]. It is important to ensure that opt-out screening remains voluntary without undue coercion or pressure [46].

Some prisoners may find the initial committal time very distressing with many competing priorities [39, 55]. Delaying screening in this situation to a later time when the prisoner is more settled may improve uptake. Many prisoners engage in on-going risk behaviour while incarcerated and ongoing repeat screening will be required for this cohort [24, 42, 47]. However similar to risk-based screening it will require the prisoners to admit to IDU. The use of peer educators both in community and prison settings may have an important role in building trust and the reduction/elimination of stigma for these marginalised groups [2, 31, 58, 67].

It is important to recognise that tackling the public health challenge of HCV infection requires linking both community and prison-based initiatives, understanding that most prisoners spend very short periods incarcerated and most PWID will spend time in prison [42, 65]. There is strong evidence to suggest that transitioning from prison to community is a high-risk period for many prisoners including for HCV transmission [65].

It is also critical to understand that prisoners are not a homogenous group and within this cohort there is variable HCV risk, levels and severity of HCV related and other physical and mental health morbidities [29].

5. Conclusions

PWID and prisoners remain key target populations in the public health effort to eliminate HCV infection. HCV infected prisoners are by in large a subset of PWID and represent the most socially marginalised and underserved population in society. The benefits of HCV screening and treatment will have a much more positive impact on community public health and there is a strong argument for diverting funding into prison screening and treatment. Prisons, more than any other site, provide an excellent opportunity to diagnose and treat large numbers of the most marginalised and vulnerable people with chronic HCV infection that traditional medical services are failing to engage.

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D.C., W.C., J.L., M.C.V.H., designed the study and wrote the protocol. D.C., W.C., J.L., M.C.V.H., managed the literature searches and analyses. D.C., W.C., J.L., M.C.V.H., undertook the statistical analysis, and all the authors discussed the results. D.C., wrote the first draft of the manuscript. All authors revised the last draft. All the authors contributed to, and have approved, the final manuscript.

Conflict of interest

All authors have no conflict of interest.

Ethics

This study does not require ethics committee approval because is a review of published literature.

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