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HEALTH SPECIALITIES COLLABORATION IN MANAGEMENT OF HEPATITIS C IN SAUDI ARABIA

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Abstract:
In Saudi Arabia, the management of Hepatitis C has become a focal point for collaborative efforts among various health specialties, including hepatology, infectious diseases, primary care, pharmacy, and public health. This multi-disciplinary approach is essential for addressing the diverse needs of patients affected by the virus. Collaborative initiatives facilitate the sharing of knowledge, resources, and best practices among specialists, leading to more effective screening, diagnosis, and treatment protocols. By integrating specialized care and support systems, healthcare providers can enhance patient outcomes, promote adherence to treatment regimens, and ensure that all patients have access to the latest antiviral therapies. This collaboration is further supported by national health policies aimed at the eradication of Hepatitis C, which emphasize early detection and comprehensive care strategies. Training programs and workshops involving various health professionals enhance their understanding of the disease and its management, fostering a team-based approach to care. Telemedicine has also emerged as a valuable tool in connecting specialists with primary care physicians, enabling remote consultations and improving access to expert advice. Ultimately, the concerted effort among health specialties in Saudi Arabia exemplifies a holistic model of care that not only targets clinical outcomes but also prioritizes public health awareness and education to combat the stigma associated with Hepatitis C.
Keywords: Hepatitis C, Saudi Arabia, health specialties collaboration, multi-disciplinary approach, hepatology, infectious diseases

INTRODUCTION

Hepatitis C virus (HCV) infection remains a significant global health challenge, with an estimated 58 million people living with chronic infection and approximately 1.5 million new infections occurring each year [1]. The burden of HCV is not merely virological; it is a leading cause of chronic liver disease, cirrhosis, hepatocellular carcinoma (HCC), and liver-related mortality, posing substantial economic and societal costs to healthcare systems worldwide [2]. The Kingdom of Saudi Arabia (KSA) has historically been classified as a region with intermediate HCV prevalence. While significant public health efforts, particularly pre-national screening of blood donors, have successfully reduced incidence, a reservoir of chronic infection persists, demanding continued and strategic management efforts [3, 4].
The landscape of HCV management was revolutionized with the advent of direct-acting antiviral (DAA) therapies. These oral, well-tolerated regimens offer cure rates exceeding 95%, with shorter treatment durations and fewer side effects compared to the interferon-based therapies of the past [5]. This therapeutic breakthrough transformed HCV from a chronic, debilitating illness to a curable infection, making the World Health Organization's (WHO) ambitious goal of eliminating viral hepatitis as a public health threat by 2030 a tangible possibility [1]. Elimination, defined as a 90% reduction in incidence and a 65% reduction in mortality, requires a comprehensive strategy built on the pillars of prevention, diagnosis, treatment, and care [1].

However, the promise of DAAs alone is insufficient to achieve elimination. The "last mile" of the HCV care cascade—identifying undiagnosed individuals, linking them to care, initiating treatment, and ensuring sustained virologic response (SVR)—presents complex challenges that extend beyond the prescription of a highly effective drug [6]. These challenges are multifaceted and include the asymptomatic nature of early chronic infection, which leads to under-diagnosis; the concentration of cases in marginalized or hard-to-reach populations (e.g., people who inject drugs, incarcerated individuals, migrants); the presence of comorbid conditions such as HIV co-infection and chronic kidney disease; and the persistent stigma associated with the disease [7]. Furthermore, the management of advanced liver disease, both pre- and post-SVR, requires specialized monitoring for complications like portal hypertension and HCC surveillance [8].

It is within this complex clinical and public health context that the imperative for health specialties collaboration (HSC) emerges. The management of HCV can no longer be viewed as the sole purview of the hepatologist or gastroenterologist. Effective and equitable elimination demands an integrated, multidisciplinary approach that leverages the unique expertise of a diverse team of healthcare professionals [9]. This collaborative model is essential to navigate the entire patient journey, from screening to cure and long-term follow-up.

In KSA, the healthcare system is undergoing a significant transformation as part of the Vision 2030 framework, which emphasizes quality, efficiency, and patient-centered care [4]. The management of HCV stands as a prime candidate for demonstrating the value of this new direction through the implementation of robust HSC models. The Kingdom's efforts have been guided by a national viral hepatitis program that has established testing and treatment protocols. Yet, the full integration of a multidisciplinary team approach remains an area for development and optimization. This review article will explore the critical role of health specialties collaboration in the management of Hepatitis C in Saudi Arabia.

Epidemiology and Burden of Hepatitis C in Saudi Arabia:

Historically, KSA was classified as a country with intermediate HCV prevalence, with studies from the 1990s and early 2000s reporting seroprevalence rates ranging between 1% and 3% in the general population [8]. The primary drivers of transmission during this era were largely linked to inadequate infection control in healthcare settings, the receipt of unscreened blood and blood products, and traditional practices such as schistosomiasis treatment campaigns, which sometimes involved the reuse of needles [9]. The dominant genotype has consistently been HCV genotype 4, which accounts for over 50% of infections in the region, followed by genotypes 1 and 3, a distribution that has important implications for treatment selection and response [10].

A cornerstone of Saudi Arabia's successful reduction in HCV incidence was the mandatory national screening of blood donors for HCV, implemented in the early 1990s. This single policy dramatically curtailed one of the major transmission routes. Subsequent public health initiatives focused on improving infection control protocols within hospitals and clinics, further reducing iatrogenic transmission. These efforts have borne fruit, as evidenced by successive seroprevalence studies. More recent community-based and hospital-based studies now estimate the prevalence of chronic HCV infection in the general Saudi population to be significantly lower, often cited at between 0.2% and 0.8% [11, 12]. This decline positions KSA favorably on the path to achieving the WHO elimination targets.

However, this success story belies a critical and persistent challenge: the shifting burden of disease. While the overall incidence has dropped, the remaining pool of infection is increasingly concentrated in specific, and often hard-to-reach, subpopulations. This phenomenon, often described as a "concentrated epidemic," necessitates a more targeted and nuanced approach than the broad public health measures of the past. Key populations with a higher HCV prevalence include:

- **Patients with Chronic Medical Conditions:** Individuals on long-term hemodialysis for end-stage renal disease represent a persistently high-risk group due to their frequent exposure to blood and blood products. Prevalence in this cohort can be several times higher than in the general population, requiring vigilant infection control and regular screening [13].
- **People Who Inject Drugs (PWID):** While data from KSA is limited, global evidence unequivocally identifies PWID as a core group for HCV transmission. The sharing of needles and other injection paraphernalia creates a highly efficient transmission network. Reaching this marginalized population, who face significant stigma and legal barriers, is one of the most pressing challenges for elimination efforts [14].
- **Migrant Workers and Expatriates:** KSA hosts a large and diverse expatriate workforce, many of whom originate from countries with high HCV endemicity. Incomplete pre-migration screening and limited access to healthcare services can make this group a reservoir of undiagnosed infection, complicating national surveillance and control efforts [15].
- **Older Adults and Those with Historic Risk Factors:** A significant portion of the remaining chronic infections is likely among older individuals who were infected decades ago, prior to the implementation of effective blood screening and infection control. Many remain asymptomatic and undiagnosed until they present with advanced liver disease.

The burden of HCV in Saudi Arabia is therefore twofold. First, there is the direct clinical burden of chronic liver disease. Despite the declining incidence, the long latency period of HCV means that the complications of chronic infection—including cirrhosis, hepatic decompensation, and hepatocellular carcinoma (HCC)—continue to present a significant load to tertiary care centers. HCV remains a leading cause of liver transplantation in the Kingdom, representing a substantial cost to the healthcare system and a tragic outcome for a now-curable disease [12]. The management of these advanced complications demands specialized hepatology and transplant services, which are resource-intensive.

Second, there is a less visible but equally important burden: the "hidden epidemic" of undiagnosed individuals. As the overall prevalence decreases, finding the remaining undiagnosed cases becomes progressively more difficult and expensive. They are dispersed and often do not interact with the healthcare system until the late stages of the disease. This underscores the inadequacy of a passive, physician-driven testing model and calls for an active, systematic, and collaborative case-finding strategy [15].

Critical Gaps in the HCV Patient Journey in KSA

The ideal, unimpeded HCV care cascade consists of five core stages: (1) Diagnosis of all infected individuals in the population; (2) Linkage to care following diagnosis; (3) Initiation of DAA treatment; (4) Adherence to the full treatment regimen; and (5) Achievement of Sustained Virologic Response (SVR), confirming a cure [15]. Globally, and in KSA, the cascade is characterized not by a steady flow but by a progressive "leakage" of patients at each step, with the most substantial losses occurring at the very beginning.

The most formidable barrier to HCV elimination in Saudi Arabia remains the vast pool of undiagnosed individuals. As the general population prevalence has decreased, the remaining cases are increasingly hidden within specific subpopulations that have limited interaction with conventional healthcare settings. A study modeling the HCV cascade in the Middle East estimated that only 30-50% of all HCV-infected individuals in the region are aware of their status [16]. In KSA, this translates to tens of thousands of people living with an undiagnosed, progressive infection. The reasons are multifactorial: the predominantly asymptomatic nature of chronic HCV for decades; the persistence of stigma that discourages testing; and a healthcare model that often relies on risk-based or symptomatic testing rather than proactive, widespread screening. While the Saudi Ministry of Health has endorsed screening recommendations, their implementation is inconsistent, particularly in primary care centers where opportunistic screening of birth cohorts or the general adult population could be most effective [17].

For the minority of patients who do receive a diagnosis, the next critical juncture is linkage to specialist care. A positive HCV antibody test, often generated in a primary care clinic, a blood bank, or during pre-operative screening, is merely the starting point. It must be followed by a confirmatory RNA test and an appointment with a physician (typically a gastroenterologist, hepatologist, or infectious disease specialist) who can prescribe DAAs. This is where the second major gap emerges. Loss to follow-up between diagnosis and specialist consultation is a well-documented problem. Barriers include:

- **Fragmented Health Records:** Lack of integrated electronic health systems can lead to a positive test result not being acted upon.
- **Complex Referral Pathways:** Bureaucratic or unclear referral processes from primary to tertiary care can delay or prevent appointments.
- **Patient-Related Factors:** Asymptomatic patients, upon receiving a diagnosis, may not perceive the urgency of follow-up, especially if they face logistical hurdles like transportation, cost (despite general coverage), or taking time off work [18].

Even when successfully linked to a specialist, not all patients immediately commence treatment. Delays in treatment initiation can occur due to logistical and clinical barriers. These include prior authorization requirements from insurance providers, which can create administrative delays. Furthermore, physicians may postpone treatment to manage comorbid conditions first, such as uncontrolled diabetes or significant psychiatric illness, or to conduct further staging workups like a FibroScan or liver biopsy. In some cases, a "watchful waiting" approach for patients with minimal fibrosis, though no longer recommended in the DAA era, may still be practiced by some clinicians, creating an unnecessary bottleneck [19].

Thankfully, the steps following treatment initiation—adherence and achieving SVR—represent the most robust part of the cascade in KSA. DAA regimens are short-duration (8-12 weeks), oral, and have excellent tolerability, leading to adherence rates typically exceeding 90% [20]. Consequently, SVR rates reported from Saudi treatment cohorts consistently align with global clinical trials, ranging from 95% to 98% [21]. The challenge here is not efficacy but ensuring that all patients who start treatment are appropriately monitored and have their SVR confirmed with a post-treatment RNA test, a final but crucial step that can sometimes be overlooked.

The analysis of the Saudi HCV care cascade reveals that the system's weaknesses are not in its ability to cure the disease, but in its capacity to find and engage patients. The critical gaps are:

1. **The Diagnostic Gap:** The failure to identify the vast majority of infected individuals.

2. **The Linkage Gap:** The failure to seamlessly transition diagnosed patients from the point of diagnosis to the point of care.

These gaps are not failures of clinical medicine but of public health strategy and system design. They highlight that a physician-centric model, which waits for symptomatic or high-risk patients to present themselves, is obsolete for achieving elimination. The patients who are lost are often those who are asymptomatic, socially marginalized, geographically remote, or simply unaware of their risk [4].

Multidisciplinary Team (MDT) Model:

The identification of critical gaps in the Hepatitis C care cascade makes it unequivocally clear that the traditional, hepatologist-centric model of care is inadequate for the complexities of modern HCV elimination. The journey from suspicion of infection to confirmed cure traverses multiple clinical, psychological, and social domains, necessitating a coordinated response from a diverse team of healthcare professionals. The Multidisciplinary Team (MDT) model is the operational embodiment of health specialties collaboration, designed to address the entirety of the patient's journey.

1. **Hepatologist/Gastroenterologist and Infectious Disease Specialist: The Clinical Architects**

As the experts in liver disease and complex infections, these physicians hold the ultimate responsibility for medical diagnosis, staging of liver fibrosis (via non-invasive tests like FibroScan or APRI/FIB-4 scores), selection of the most appropriate DAA regimen, and management of advanced liver complications. Their role is to confirm the treatment plan, manage any on-treatment clinical issues, and interpret the SVR result. In the MDT, they lead the clinical decision-making but rely on the team for patient preparation, monitoring, and follow-up [22].

2. **The Nurse Coordinator: The Linchpin of the Cascade**

The dedicated HCV nurse coordinator is arguably the most critical member for ensuring seamless patient flow. This role serves as the central point of contact for the patient and the communication hub for the entire team. Their responsibilities are vast and pivotal to closing the linkage and adherence gaps:

- **Post-Diagnosis Linkage:** They actively track positive screening tests and proactively contact patients to schedule appointments, providing essential education and reassurance immediately after diagnosis [23].
- **Patient Education and Navigation:** They demystify the disease and treatment process, address misconceptions, and guide the patient through the healthcare system.
- **Adherence Support:** They conduct regular follow-up calls during treatment to monitor for side effects, reinforce adherence, and troubleshoot any issues, significantly improving completion rates [24].
- **Care Coordination:** They ensure all necessary pre-treatment investigations are completed and facilitate communication between the primary care physician, pharmacist, and specialist.

3. **The Clinical Pharmacist: The Guardian of Therapeutic Efficacy and Safety**

With the advent of DAAs, the pharmacist's role has evolved from dispenser to a crucial clinical partner. Their expertise is vital in several key areas:

- **Drug-Drug Interaction (DDI) Management:** DAAs, particularly those like glecaprevir/pibrentasvir, have significant potential for interactions with common medications (e.g., statins, proton-pump inhibitors, certain anticonvulsants). The pharmacist conducts a comprehensive medication reconciliation to identify and manage these DDIs, often recommending alternative therapies to avoid reduced efficacy or toxicity [25].
- **Patient Counseling:** They provide detailed, structured counseling on how to take the medication, manage common side effects, and the importance of adherence.
- **Logistical Support:** They often assist in navigating insurance prior authorizations and ensuring timely availability of the DAA regimen.

4. **Psychiatrist/Psychologist and Addiction Specialist: Addressing the Root Causes and Barriers**

Mental health and substance use disorders are deeply intertwined with the HCV epidemic. A psychiatrist or psychologist is essential for:

- **Managing Comorbid Psychiatric Conditions:** Treating underlying depression, anxiety, or psychosis that may impair a patient's ability to engage with care or adhere to treatment.
- **Addressing Substance Use Disorders (SUD):** For People Who Inject Drugs (PWID), the addiction specialist is fundamental. The outdated concept of requiring a period of abstinence before treatment has been debunked. The modern standard of care is to offer HCV treatment concurrently with addiction treatment, including opioid agonist therapy (OAT). This integrated approach is both effective and a cornerstone of reaching this key population [26].

5. **Primary Care Physician (PCP): The Frontline Sentinel and Sustainer**

The PCP is the most accessible healthcare provider and plays a dual role in the MDT.

- **Case Finder:** By integrating universal or birth cohort-based HCV screening into routine primary care visits, PCPs can cast the widest possible net to identify the undiagnosed [27].
- **Co-manager and Long-Term Partner:** Post-SVR, the PCP assumes responsibility for the patient's long-term health, including monitoring for metabolic syndrome, which is a continued risk factor for liver disease, and ensuring ongoing HCC surveillance in patients with advanced fibrosis at baseline.

6. **Social Worker: The Remover of Systemic Barriers**

The social worker addresses the non-clinical determinants of health that often derail the care cascade. They assist patients with:

- **Navigating Health Insurance and Financial Systems:** Helping to overcome cost-related barriers, even within a largely public system.
- **Addressing Logistical Hurdles:** Providing resources for transportation or coordinating appointments to minimize time off work.
- **Stigma Reduction and Counseling:** Offering psychosocial support to help patients cope with the diagnosis and navigate societal or familial stigma [28].

The power of the MDT model lies not in the isolated actions of its members, but in their synergy. For example, a patient who is a PWID might be identified by a proactive PCP. The nurse coordinator then links them to care, providing empathetic support. The hepatologist confirms the treatment plan, while the addiction specialist and psychiatrist concurrently manage the opioid use disorder and underlying depression. The pharmacist ensures the DAA does not interact with any psychiatric medications, and the social worker helps secure stable housing. This wraparound care addresses the patient's medical, psychological, and social needs simultaneously, creating an environment where successful treatment is not just possible, but probable.

Implementing Collaborative Care:

The theoretical benefits of a Multidisciplinary Team (MDT) are undeniable, but its real-world success in managing Hepatitis C in Saudi Arabia hinges on its practical implementation. Moving from a siloed model to a collaborative one requires deliberate structural frameworks, clear protocols, and robust communication strategies. Without these operational pillars, the MDT risks becoming an ad-hoc committee rather than an integrated, efficient engine of care delivery.

A critical first step is defining the physical and logistical structure of the MDT. Two predominant models have proven effective and can be adapted to the Saudi context:

1. **The Integrated "One-Stop Shop" Clinic:** This model co-locates the core MDT members in a single dedicated clinic, either within a tertiary hospital or a large primary care center. On a designated "HCV day," the patient can see the nurse coordinator for education, the pharmacist for medication review and counseling, and the hepatologist for the final prescription in a single visit. This model dramatically reduces the number of appointments and travel burdens for the patient, thereby directly addressing a major cause of pre-treatment loss to follow-up [28]. It fosters informal, "curbside" consultation among team members, enhancing cohesion and problem-solving. For Saudi Arabia, piloting such clinics in major urban centers like Riyadh, Jeddah, and Dammam would be a logical starting point.
2. **The Hub-and-Spoke Model with Telemedicine Support:** Given the Kingdom's vast geography, the one-stop shop may not be feasible for all patients. The hub-and-spoke model is essential for ensuring nationwide equity. In this framework, the tertiary care hospital (the "hub") with a full MDT supports smaller primary care centers and regional hospitals (the "spokes"). Primary care physicians at the spokes conduct screening and diagnosis. Through structured telemedicine platforms, the hub-based MDT can then conduct virtual consultations, review cases with the spoke-based team, and provide remote supervision for DAA initiation and monitoring. This model empowers PCPs and decentralizes care while maintaining a high standard of specialist oversight, making it ideal for reaching populations in remote areas like the Southern Region or Al-Qassim [29].

Consistency and quality are maintained through the development and universal adoption of evidence-based, national clinical protocols. These protocols, such as those already established by the Saudi Association for the Study of Liver Diseases and Transplantation (SASLT), must be expanded to explicitly include the roles and responsibilities of each MDT member [30]. Key protocols should cover:

- **Standardized Referral Pathways:** A clear algorithm for PCPs and other clinicians to refer newly diagnosed patients directly to the MDT coordinator, bypassing lengthy general specialist queues.
- **Pre-Treatment Workup Checklist:** A mandatory checklist managed by the nurse coordinator to ensure all necessary labs (HCV RNA, genotype, liver function tests, renal function), fibrosis staging, and vaccination status are completed before the hepatology consultation.
- **DAA Selection and DDI Management Algorithm:** A standardized guide, heavily utilized by the clinical pharmacist, for choosing a regimen and managing common drug interactions, ensuring uniformity and safety across all prescribers [31].
- **Management of Special Populations:** Explicit protocols for treating patients with renal impairment, decompensated cirrhosis, or those who are active PWID, ensuring that these complex cases receive consistent, guideline-concordant care across different centers [26].

The Central Role of Structured Communication and the Electronic Health Record

Effective collaboration is impossible without seamless communication. Regular, structured MDT meetings are the cornerstone of this process. These should be weekly or bi-weekly case conferences where complex cases are presented,

and management plans are collectively formulated. Beyond meetings, communication must be embedded in daily workflow:

- **The MDT Coordinator as a Communication Hub:** The nurse coordinator actively facilitates communication, ensuring that the pharmacist's DDI report is seen by the hepatologist, that the social worker's assessment is considered in the treatment timeline, and that the PCP receives a summary after the patient is linked to care.
- **Leveraging the Electronic Health Record (EHR):** A well-integrated EHR system is the technological backbone of the MDT. It should allow for:
  - **Shared Care Plans:** A single, accessible document outlining the patient's treatment plan, visible to all team members.
  - **Secure Messaging:** Built-in platforms for asynchronous communication between team members to ask questions and share updates without relying on informal channels.
  - **Automated Alerts and Task Assignment:** The system can flag a positive HCV screen for the coordinator, prompt the pharmacist to perform a medication review upon DAA prescription, and remind the PCP to schedule an SVR test [32].

Addressing the Human and Cultural Factors in Implementation

Finally, successful implementation requires attention to the "soft" factors of organizational change. This includes:

- **Defining Leadership and Accountability:** Appointing a clinical lead (e.g., the head of hepatology) and an administrative lead to drive the MDT forward, manage conflicts, and secure necessary resources.
- **Interprofessional Education:** Conducting joint training sessions to foster mutual respect and a clear understanding of each profession's scope and contribution, breaking down traditional hierarchical barriers.
- **Culturally Competent Workflow Design:** Ensuring that workflows respect local customs, such as providing gender-concordant care when requested and ensuring educational materials are available in multiple languages relevant to the expatriate population [33].

CONCLUSION

The journey towards the elimination of Hepatitis C as a public health threat in Saudi Arabia stands at a pivotal crossroads. The remarkable success in reducing overall prevalence through historic public health measures and the advent of curative Direct-Acting Antiviral (DAA) therapies have created an unprecedented opportunity. However, as this review has detailed, this final mile of the elimination journey is the most complex. The remaining challenges are not virological but systemic, rooted in the intricacies of healthcare delivery, patient engagement, and societal barriers. The analysis of the HCV care cascade in KSA reveals that the critical points of failure are the "diagnostic gap" and the "linkage gap." A persistent, physician-centric model is ill-equipped to find the hidden, often marginalized populations living with undiagnosed HCV or to navigate the logistical and psychosocial hurdles that prevent diagnosed patients from accessing treatment. The evidence is clear: the magic bullet of DAAs requires a smart gun. That smart gun is a robust, well-implemented, and patient-centered Multidisciplinary Team (MDT) model.

This review has articulated the compelling case for health specialties collaboration as the indispensable strategy for achieving elimination. The MDT model, comprising hepatologists, nurse coordinators, pharmacists, psychiatrists, primary care physicians, and social workers, is not merely an assembly of experts but a synergistic force. Each member plays a distinct and vital role in fortifying a specific weak point in the care pathway. The nurse coordinator acts as the linchpin, ensuring seamless linkage and retention; the clinical pharmacist safeguards therapeutic efficacy; the mental health and addiction specialist unlocks care for the hardest-to-reach; and the primary care physician serves as the essential sentinel and long-term partner in health. This collaborative approach transforms the patient journey from a fragmented series of appointments into a cohesive, supportive, and efficient experience.

For Saudi Arabia, the implementation of this model is perfectly aligned with the ambitious goals of Vision 2030, which emphasizes quality, efficiency, and patient-centricity in the healthcare sector. The operational frameworks discussed—such as the "one-stop shop" clinic for urban centers and the telemedicine-supported "hub-and-spoke" model for remote regions—provide a practical blueprint for nationwide rollout. By embedding standardized protocols, leveraging electronic health records, and fostering a culture of interprofessional collaboration, the Saudi healthcare system can build the necessary infrastructure to support these teams.

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