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## Disease management organisation approach to chronic illness

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**Abstract:** This paper states that traditional facilities (i.e., hospitals, remote physician offices or referral care) may not be the best choice for chronic diseases that require long-term care. The increased need for specialised managed care for the growing numbers in the USA who require such care suggests that a disease management organisation (DMO) approach can best diagnose, treat and use health informatics to create treatment protocols for that specific population. Chronic viral hepatitis in Central Florida is presented to illustrate the need for DMOs that have a centralised structure, provide a platform for data acquisition through patient evaluation and diagnosis and provide both immediate treatment recommendations and long-term health monitoring. Unless surgery or an emergency requires acute care, this paper suggests building local capacity in terms of DMOs for managing chronic illness versus hospital management, on the premise that separate facilities can provide more cost-effective and defined treatment for the compounding aspects of chronic disease, to achieve the best outcomes for patients.

**Keywords:** hospital; disease management organisations; DMOs; local capacity building; chronic viral hepatitis; chronic illness; healthcare informatics research; national treatment models; healthcare cost reduction.

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## **1 Introduction**

‘Chronic diseases are now the major cause of death and disability worldwide. Non-communicable conditions, including cardiovascular diseases, diabetes, obesity, cancer and respiratory diseases, now account for 59% of the 56.5 million deaths annually and 45.9% of the global burden of diseases’ (Ewert et al., 2004). The economic and social impact of chronic diseases has greatly influenced the development of healthcare organisations. A promising approach is that of a disease management organisation (DMO), a team of providers who identify the at-risk population and deliver coordinated, effective and efficient services (Omran, 1971; Frederiksen, 1969; Frenk et al., 1989; Wan, 2002). The logical starting point for this approach is to identify and assess the need for care among the at-risk population. That initial step depends on the availability of accurate health information. Then to set up care plans, monitor outcomes and evaluate them, a strong public health informatics network is needed to provide the relevant data for an integrated care delivery system. Unfortunately, however, only limited and disjointed data are available, which often are in formats unusable for programme planning and evaluation.

Information technology can efficiently capture massive amounts of disjointed data and store them under a theoretically informed framework for developing support systems for clinical and administrative decisions. Researchers have consistently advocated evidence-based healthcare (Wan, 2002) and data standards (Wan, 2001; Madden et al., 2003). The lack of adequate information for planning and managing care is compounded by inconsistent and/or absent nomenclature, multiple definitions across disparate data fields and invalid and unreliable outcome measures.

The purpose of this paper is to outline how health informatics research can develop a highly feasible case management strategy for chronic conditions as applied in DMOs. Using viral hepatitis as an example, the paper illustrates how data could be converted into useful knowledge to guide changes in the delivery of public and personal health services.

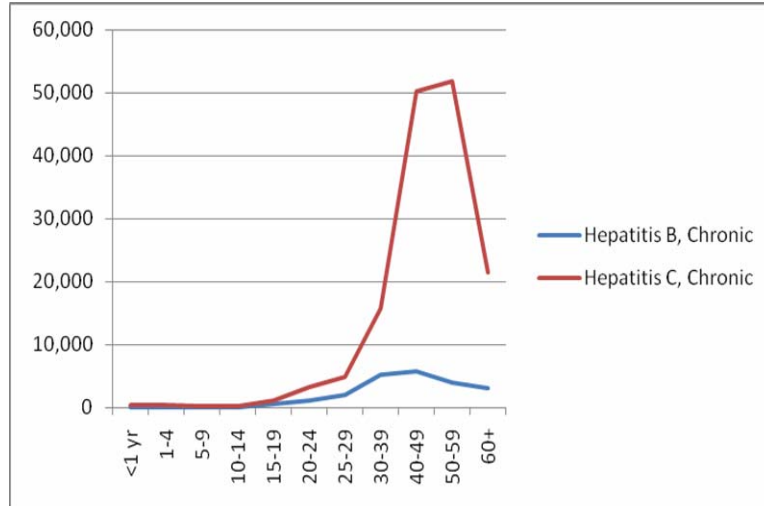
## **2 Identification of the prevalence and incidence of viral hepatitis**

Consider the case of chronic viral hepatitis in Florida. Viral hepatitis is categorised by the type of viral strain causing the disease; the most prevalent types in the USA are hepatitis A, hepatitis B and hepatitis C (US Center for Disease Control and Prevention, 2008). The CDC’s website provides extensive data on viral hepatitis including definitions and general information.

In general, hepatitis A is an acute infection caused by the hepatitis A virus known as HAV, which vaccination can prevent. Hepatitis A is not a chronic condition. However, both hepatitis B and hepatitis C can cause chronic liver disease. The various modes of transmission of the hepatitis B virus (HBV) and the hepatitis C virus (HCV) normally occur through contact with body fluids.

The Florida Office of Vital Statistics Annual Report (2007) listed chronic liver disease/cirrhosis as the fifth leading cause of death for state residents between the ages of 45–54, based on a rate of 610 deaths per 100,000 (Figure 1). The Florida Department of Health (2009a) projects a potential dramatic increase of this rate in this and other age groups on the basis of reported cases, the rising population in Florida, its behavioural attributes and the state’s high transit population (84+ million annual visitors).

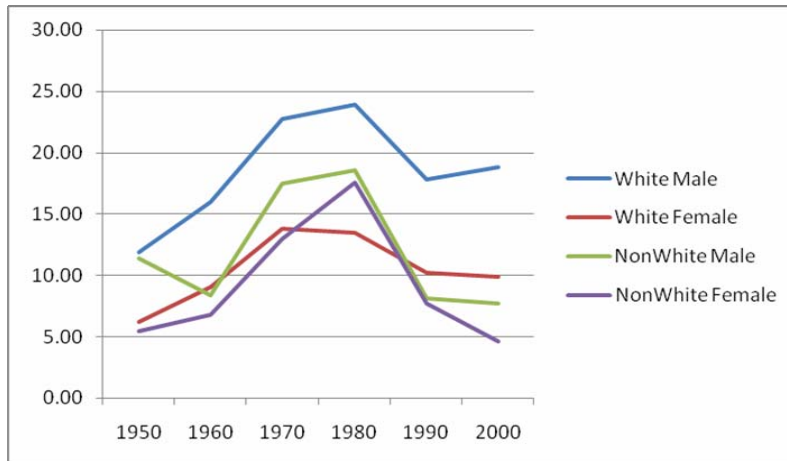
**Figure 1** Florida resident incidence of chronic hepatitis B, C by age group for years 2000–2008 (see online version for colours)



Source: Florida Department of Health (2009b)

From 1950 to 1980, the death rates for chronic liver disease and cirrhosis per 100,000 steadily increased in Florida, irrespective of race and gender. Figure 2 paints only part of the picture for viral hepatitis, categorised by the United States Centers for Disease Control and Prevention as inflammation of the liver from viral infection. The alarming rate of reported incidence makes the possibilities of unreported cases increasingly significant. The community health threat inherent in the potential for unknown and therefore untreated cases drives the urgent quest for solutions by healthcare organisations at the local, state and national levels.

**Figure 2** Florida resident chronic liver disease and cirrhosis deaths by decade and rate of disease per 100,000, 1950–2000 (see online version for colours)



Source: Florida Office of Vital Statistics Annual Report (2007)

Chronic viral hepatitis transmitted by HBV and HCV can lead to debilitating symptoms and eventual loss of liver function. But even as concern arises in public health, the asymptomatic nature of the disease means that devising mechanisms to educate, vaccinate and treat those currently infected or at a sub-clinical state with viral hepatitis is a daunting challenge.

**Table 1** Hepatitis B, C general distribution in various populations, 2006 (2008)

|                      | <i>Incidence in USA<sup>a</sup></i> | <i>Incidence in Florida<sup>b</sup></i> | <i>Incidence of HBV, counties (Brevard, Osceola, Lake, Orange and Seminole)<sup>c</sup></i> |
|----------------------|-------------------------------------|---|---|
| Hepatitis B, chronic | 800,000–1.4 million <sup>d</sup>    | 2,889 (3,954)                           | 584 (834)   |
| Hepatitis C, chronic | 3.2 million <sup>e</sup>            | 19,905 (26,692)                         | 2,012 <sup>1</sup> (4,700)  |

*Source:* <sup>a</sup>Department of Health and Human Services Center for Disease Control and Prevention (2008)  
<sup>b,c</sup>Florida Department of Health (2009b)  
<sup>d</sup>US Center for Disease Control and Prevention (2008)  
<sup>e</sup>Armstrong et al. (2006)

Table 1 shows the distribution of HBV and HCV at three population levels:

- 1 five Central Florida counties
- 2 the State of Florida
- 3 the USA.

The data compiled nationally are limited to the period of 2006. Thus, 2008 state and county data were added in parentheses to show current increases. The 2006 data provide a snapshot of the incidence rate of chronic HBV and HCV for the same year, for a consistent comparison across all populations.

As alarming as the numbers in Table 1 are, alarm itself cannot generate the facts about chronic hepatitis in Florida that are necessary for the scientific inquiry that could prompt policies establishing the needed patient-centred treatment (Wan, 2001).

### 3 Preventive strategies

The efforts to check the continuous spread of viral hepatitis rely on primary, secondary and tertiary preventative activities. Primary and secondary efforts combine education and screenings as both prevention and a mechanism for accurately assessing the current rate of disease incidence. Tertiary efforts are not only rehabilitation to reduce morbidity, but also funding and making the development of long-term plans for curtailing the disabling effects of hepatitis. These efforts should be a major public health issue.

The lack of DMOs that specifically address chronic hepatitis may be attributed to several factors: the lack of rich layers of data supporting population-based treatment, lack of funding for research to quantify the need, the difficulties presented by the multiple known and unknown factors contributing to the spread of viral hepatitis. Even more urgent is the unresponsiveness that traps in a vicious cycle those who are finally properly diagnosed with chronic hepatitis, but cannot receive treatment because neither funds nor referrals to treatment are available.

### 3.1 Primary strategy: education to avoid transmission

Local preventive efforts in Orange County and surrounding areas include counselling, testing, hepatitis A and B vaccination, support groups for patients with chronic viral hepatitis and educational and outreach programmes. Since treatment services are limited and/or non-existent unless candidates satisfy specific criteria, most hepatitis programmes focus on educating the public to take precautions that reduce the risk of transmission.

The preventive approach, though admirable, leaves millions susceptible to the long-term effects of undetected disease. Neither does it address the growing public health risk of the long-term implications of chronic liver disease.

A healthy hepatic system is essential for both longevity and the quality of life. The liver filters toxic material from the blood and helps to metabolise fat and sugars. It also synthesises the proteins that direct several body functions. Thus, the chronic forms of hepatitis can lead to end stage liver disease.

More cases of life-threatening liver disease mean a greater need for liver donors. However, the donor supply already has experienced shortages, since the need for liver transplants in the USA has risen steadily over the past 15 years (American Liver Foundation, 2008). More than 17,000 Americans are now awaiting liver transplants. The inability to meet the increased need for donors makes it urgent to reduce the number of cases of viral hepatitis through vaccination and prevention education. Moreover, viral hepatitis is not the sole cause of the rising demand for liver donations, which is also due to HIV and tuberculosis. The disparity between the need and available organ donations can be expected to increase.

- *Recommendations:* Initiate an informed consent process that would allow surveys to be submitted to established community support groups with the intent to determine the individual characteristics of the patient subpopulation, the characteristics of the environment, how patients learned of their health status and the nature of their psychological, social and economic systems of support (Wilson and Cleary, 1996). Establish systemic and disease-specific data fields to begin acquiring the data needed to elicit funding.
- *Outcome:* The Australian Institute of Health and Welfare has been a proving ground for the establishment of a national data repository and data dictionary, in conjunction with the World Health Organization, for the development of the International Classification of Functioning, Disability and Health (Madden et al., 2003). Though the Australian population and ethnic distribution differs from those of the USA, the ICF is a common framework that can help to expedite policy development and the allocation of funding by providing a consistent method for estimating the unmet need for appropriate support services.

A similar health informatics technology approach has been deemed 'successful' in that the medical quality and patient care under the US Veteran's Health Administration have noticeably improved through its use (Oliver, 2007). That demonstrable success has not, however, prompted the civilian medical community to follow suit (Marmor et al., 2009).

### 3.2 Secondary strategy: screening

In the USA, HCV, considered the most common blood-borne viral infection among the residents of Florida, has caused an estimated 300,000 infections (Rainey, 2007). A fundamental difficulty for population health policy concerning HCV infections is the obstacle to identification: many of those with HCV-infected status do not know it. Without HCV identification, treatment, the prevention of further liver damage for those infected, and halting the spread of the disease are all obstructed. Coupled with the lack of HCV vaccination, the cumulative impact with the lack of identification can pose an even greater population health risk.

The CDC's recommendation for national prevention and control includes screening of blood donors and a process of deactivating viruses that may be in plasma-derived products. However, many studies have concluded that screening for HBV is not cost effective, since more immediate effects at reduced costs have been achieved through vaccination. Also, early detection through screening population at high risk for HCV (those lacking access to healthcare and/or addicted to alcohol or injected drugs) can lead to counselling about antiviral therapy. Counselling can promote cessation or modification of activities known to contribute to HCV-related hepatic damage and can lead to recommendations to medically monitor antiviral therapy that assists in the reduction of the progression of liver disease (Malette et al., 2008).

Trepka et al. (2007) state, "Decreasing alcohol consumption may be one of the most important potential intermediate benefits of screening and counseling", but caution that the empirical data are sometimes conflicting, depending on the type of population under study. Nevertheless, it is a clear clinical necessity to stop or drastically reduce abusive drinking in order to receive treatment for the viral infection. This fact alone is significant for the hope to improve the health of those with the disease, even as it serves as a preventative warning.

- *Recommendations:* In the interest of public health, hepatitis screening should be part of regular physical examinations on the basis of personal profiles at high-risk locations. Patient education and counselling to increase health literacy should also be included (Edwards et al., 2009).
- *Outcome:* Immediately increase the knowledge about subpopulations that will prompt the funding allocation and business support for the creation of DMOs specifically for chronic disease management.

### 3.3 Tertiary strategy: stop spread

Both addressing behaviours and increasing access to healthcare and medical interventions are required in order to diagnose, treat and prevent the spread of hepatitis in a community. Chronic disease management is not, however, limited to those used in that illustration. In a study of Virginia Medicaid beneficiaries that used physician and pharmaceutical treatment protocols, statistical significance was achieved for using disease management for the following chronic diseases: diabetes, hypertension and illness associated with congestive heart failure, clinical depression, gastro-oesophageal reflux disease and/or peptic ulcer disease and chronic obstructive pulmonary disease or

asthma (Zhang et al., 2008). The additional medical risks now known to be associated with chronic diseases and co-morbidity emphasise the urgent need for long-term solutions, exemplified by new evidence that hepatitis C increases the risk of cardiovascular disease (Butt et al., 2009). It is becoming increasingly clear that chronic disease management must encompass large-scale information to support the level of care required for treating the complications of chronic disorders, both infectious and non-infectious. Because of the asymptomatic nature of chronic viral hepatitis, which can be confirmed only through medical intervention with the hope of early detection to offset its long-term consequences, halting the spread of this chronic infection is challenging. The formulation of plans to stop the spread of the disease to other members of the community who generally do not participate in at-risk behaviours is problematic unless directed medical intervention activities are heightened.

Table 2 compares five counties in Central Florida in relation to adults who engage in heavy or binge drinking and shows the relative differences between the rates during the five year period from 2002 and 2007. For additional population demographics, the socioeconomic status (SES) demonstrated by annual income is listed.

**Table 2** Percentages of adults who engage in heavy or binge drinking, with categories of annual income

|             | <i>Central Florida county comparison</i> |                      |           |           |                      |           |
|-------------|--|----------------------|-----------|-----------|----------------------|-----------|
|             | 2002                                     |                      |           | 2007      |                      |           |
|             | <\$25,000                                | \$25,000 to \$50,000 | >\$50,000 | <\$25,000 | \$25,000 to \$50,000 | >\$50,000 |
| State total | 15.3                                     | 15.5                 | 20.4      | 14.2      | 14.7                 | 19.9      |
| Brevard     | 26.6                                     | 20.4                 | 18.1      | 20.3      | 16.6                 | 30.0      |
| Lake        | 17.5                                     | 15.9                 | 11.5      | 9.90      | 22.2                 | 13.5      |
| Orange      | 21.2                                     | 19.4                 | 18.7      | 17.9      | 16.6                 | 21.1      |
| Osceola     | 10.9                                     | 14.2                 | 18.8      | 7.10      | 16.9                 | 18.0      |
| Seminole    | 17.8                                     | 26.0                 | 18.3      | 14.7      | 17.8                 | 26.1      |

Notes: The Behavioral Risk Factors Surveillance Telephone Survey (BRFSS) is a random survey. Specific criteria for gathering data are detailed by the Florida Department of Health, Bureau of Epidemiology.

*Source:* Florida county-level BRFSS conducted by the Florida Department of Health (2009a, 2009b), Bureau of Epidemiology

Note that individually, each county experienced both an increase and decrease in the categories. For example, 2002 figures for Orange County show that this indicator was consistently higher than state averages across the lower two annual salary ranges. However, the 2007 figures for Orange County show a marked increase in the highest annual income category, while both the <\$25,000 and \$25,000 to \$50,000 categories remained higher than state-wide levels despite a decrease from 2002 figures. Further, even though Brevard County showed a marked reduction in rates for income levels except for >\$50,000 from 2002 to 2007, all categories remained noticeably higher than the state levels in 2007, with an especially dramatic increase in the percentage of those earning >\$50,000 who engaged in such drinking behaviours.

According to the US Census Bureau's estimates, the national median income was \$50,740 in 2007, and the State of Florida's median was lower, at \$47,804. For comparison, the median income for Brevard County was \$50,261, for Lake \$46,557, for Orange \$50,988, for Osceola \$46,599 and \$56,315 for Seminole.

Table 3 illustrates how alcohol consumption can increase the incidence of viral hepatitis and the table projects an alarming increase in the numbers of residents at risk. More than three million residents of the state may face the onset of the disease or facing its progression, as a result of alcohol consumption. Nearly 1/6 of that number, or approximately a half million of those at risk, can theoretically be generated within the five Central Florida communities shown here. The debilitating aspects of the disease have costs that may be devastating if its incidence is allowed to progress.

**Table 3** Percentages of adults with binge or heavy drinking and consequent risk of liver disease, for Florida and for five Central Florida counties<sup>a</sup>

| <i>Midyear 2007 resident population</i> |                          |  |   |
|---|--------------------------|--|---|
|   | <i>Total<sup>b</sup></i> | <i>% adults at risk activity<br/>binge or heavy drinking<sup>c</sup></i> | <i>Total estimated<br/>population at risk</i> |
| State of Florida                        | 18,731,287               | 16.2   | 3,034,469                                     |
| <i>Counties of interest</i>             |                          |  |   |
| Brevard                                 | 553,481                  | 21.6   | 119,552                                       |
| Lake                                    | 288,078                  | 14.4   | 41,483  |
| Orange                                  | 1,109,714                | 17.5   | 194,200                                       |
| Osceola                                 | 267,510                  | 14.5   | 38,789  |
| Seminole                                | 426,364                  | 20.4   | 86,978  |
| Central Florida five<br>county total    |                          |  | 481,002                                       |

*Source:* <sup>a</sup>Florida county-level BRFSS conducted by the Florida Department of Health (2009a, 2009b), Bureau of Epidemiology, 2007

<sup>b</sup>The Florida Legislature, Office of Economic and Demographic Research

<sup>c</sup>Florida Department of Health (2009a, 2009b)

If no effort is made to moderate alcohol consumption, the alcohol consumption factor alone can increase the distribution of chronic hepatitis in Central Florida counties as the population increases.

Using the estimated percentages of at-risk adults at midyear 2007 in Table 3, and the projected population growth from 2009 to 2014 in Table 4, Figures 3 and 4 respectively, provide graphic demonstrations of how the population increase in Florida coupled with a single type of at-risk behaviour has the potential to substantially increase viral hepatitis cases in the five counties of Central Florida, notably Orange County, and in the State of Florida.

The second factor to consider is access to healthcare, demonstrated by the lack of any type of insurance coverage, as detailed in Table 5. Medical care is essential to diagnose and treat, particularly for those who are asymptomatic. Note that in three of the five counties that represent Central Florida (Orange, Osceola and Seminole), the percentages of those lacking coverage were at or below statewide totals in 2002, but were still greater



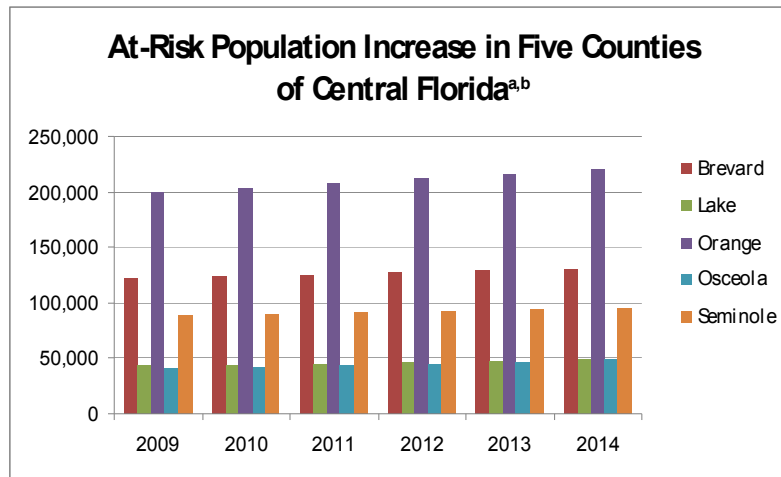
than US totals. By 2007, all but Brevard County remained at or above both Florida and USA figures.

**Table 4** Projected numbers of adults at risk for chronic liver disease through heavy or binge drinking, State of Florida and five counties<sup>a</sup>

|                                   | 2009 <sup>b</sup> | 2010 <sup>b</sup> | 2011 <sup>b</sup> | 2012 <sup>b</sup> | 2013 <sup>b</sup> | 2014 <sup>b</sup> |
|-----------------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| State of Florida                  | 3,096,674         | 3,139,981         | 3,194,228         | 3,249,854         | 3,303,738         | 3,356,211         |
| Brevard                           | 121,709           | 123,237           | 125,183           | 127,176           | 129,098           | 130,966           |
| Lake                              | 43,018            | 43,966            | 45,171            | 46,479            | 47,808            | 49,132            |
| Orange                            | 199,463           | 202,955           | 207,338           | 211,955           | 216,540           | 221,057           |
| Osceola                           | 40,719            | 42,044            | 43,607            | 45,256            | 46,912            | 48,555            |
| Seminole                          | 88,629            | 89,963            | 91,536            | 93,083            | 94,540            | 95,940            |
| Central Florida five county total | 493,538           | 502,165           | 512,835           | 523,949           | 534,898           | 545,650           |

Source: <sup>a</sup>Florida county-level BRFSS conducted by the Florida Department of Health (2009a, 2009b), Bureau of Epidemiology, 2007  
<sup>b</sup>The Florida Legislature, Office of Economic and Demographic Research

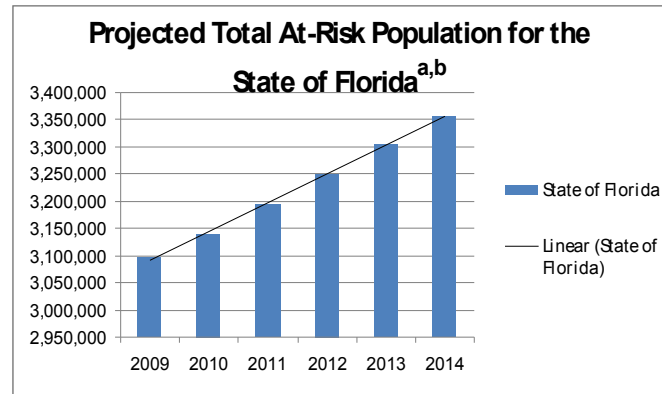
**Figure 3** Graphic results of the projected numbers of adults at risk for chronic liver disease from the population in five Central Florida counties, 2009–2014 (see online version for colours)



Note: Derived from heavy or binge drinking estimates in Table 4.

Source: <sup>a</sup>Florida county-level BRFSS conducted by the Florida Department of Health (2009a, 2009b), Bureau of Epidemiology, 2007.  
<sup>b</sup>The Florida Legislature, Office of Economic and Demographic Research

**Figure 4** Population increase effect on prospective number of at risk adults by activity: heavy or binge drinking, expected to impact distribution of viral hepatitis (see online version for colours)



Source: <sup>a</sup>Florida county-level BRFSS conducted by the Florida Department of Health (2009a, 2009b), Bureau of Epidemiology, 2007  
<sup>b</sup>The Florida Legislature, Office of Economic and Demographic Research

**Table 5** Percentages of adults with no type of health insurance coverage in the USA, Florida and five central counties, 2002 and 2007<sup>a</sup>

|                          | 2002               | 2007               |
|--------------------------|--------------------|--------------------|
| US total <sup>b</sup>    | 15.2% <sup>b</sup> | 16.6% <sup>c</sup> |
| State total <sup>d</sup> | 18.7%              | 18.6%              |
| Central counties         |                    |                    |
| Brevard                  | 17.2%              | 10.2%              |
| Lake                     | 15.9%              | 16.6%              |
| Orange                   | 21.8%              | 20.3%              |
| Osceola                  | 25.6%              | 22.2%              |
| Seminole                 | 18.7%              | 18.6%              |

Source: <sup>a</sup>Florida county-level BRFSS conducted by the Florida Department of Health (2009a, 2009b), Bureau of Epidemiology  
<sup>b</sup>Mills and Bhandari (2003)  
<sup>c</sup>US Census Bureau (2009)  
<sup>d</sup>Florida CHARTS

While the numbers of US residents who were uninsured rose from 2002 to 2007, in Florida, the percentage of the adults lacking any type of health insurance coverage declined slightly. However, despite the decline, Florida still had a higher greater percentage (18.6%) of uninsured than did the nation (16.6%). Moreover, since according to the US Census Bureau, the state has had record growths (134%) since the 1970's, a slight percentage decline in the uninsured does not necessarily translate into a decline in the absolute number of them. The Florida Community Health Assessments Resource Tool Set (2009c) reports that the state ranks 42nd for the number of adults with

healthcare insurance, with a rate of insurance coverage (81.4%) that is below the national average (83.4%).

The abundant statistical information presented here requires delineation to translate the data into knowledge, according to Meltsner and Ballavita's (1983) classical distinction: data (documented observations of phenomena), are elevated to knowledge through analysis that is presented to facilitate learning and that encompasses guidance to action fostering successful outcomes (cited in Harshman et al., 2005). Clearly, by that definition, healthcare suffers not from a lack of information, but from a lack of knowledge that fosters patient-centred medical care. A DMO has been suggested as the best for accumulating knowledge, but in practice such management has fallen short of expectations, instead more closely resembling the historical structure of physician-led referral networks focused on profits.

#### **4 Functions of a DMO**

This section identifies some strategies that help to distinguish how health informatics can help to develop a DMO that could manage chronic viral hepatitis. We begin by stressing the intended functions of a DMO: to translate data to knowledge that informs decision making and ultimately elicits positive change (Wan, 2001). Unless healthcare is improved by developing 'treatment models' from the accumulation of knowledge to ensure 'patient value' (Porter and Olmsted Teisberg, 2006), a DMO remains just another healthcare facility that is not functioning as originally intended and therefore, lacks the shift in focus required for success (Wan, 2002).

The function of a DMOs programme features is to establish clinical guidelines for specialised care and the medical staff, case management and to establish education programmes, as well as claims analysis, outcomes measurement and reporting. Functions would be established through provider incentives to submit data, and through standards for data ownership, disposition of data, confidentiality of data and performance monitoring. It follows that because of the need to reduce national healthcare costs, using a DMO's appropriate functions could be embedded in an interdependent, local-to-national structure with public/private financing. That entity's management philosophy, outcome tracking and performance evaluation would achieve policy reform based on achieving the best patient outcomes through the dissemination of data.

##### *4.1 Structure*

The development of a DMO must always build on accurate information, so its organisational structure must successfully disseminate evidence to serve patient-centred objectives. Though approximately 200 organisations in Florida who are designated DMOs, most do not have the critical operating parameters that define a DMO; instead they lean heavily on financial motivators (Carroll, 2004). Their DMO designations are in name only; in practice they operate under the classic, financial priorities instead of honouring the patient-centred DMO criteria that are geared to elicit change (Wan, 2002). The fundamental assumptions of disease management require a shift in strategic thinking from the traditional healthcare behaviours to authentic disease management. The specifics of that fundamental shift are as follows: from costly standard treatment by an

individual physician, an individual pharmacist, with individual components of care provided in clinical settings to that of disease management-population-based with a team of providers and a system of care, identification of patients at risk, appropriate care, measurement of outcomes and effort for continuous quality improvement. Included in the shift of strategies should be a willingness to improve patient communication and their adherence to a medical regimen. Outcomes, patient satisfaction and costs that support an overall business proposition should be the focus, while returning healthcare management focus back to deliberate healthcare protocols.

AbouZhar et al. (2007) would be likely to deem the traditional setting in which current healthcare facilities now operate as an example of one of 'many institutional, political and practical barriers [that] impede effective use of data to inform policy'. AbouZhar et al. view healthcare facilities not designed to gather 'sound statistics' as unable to effectively use that 'key component of evidence'. Without the evidence-based practices that are critical to the function of DMOs, an organisation is doomed to fall into traditional care methods whose finance-driven, referral-based client system operates in opposition to the practice of patient-centred care (Wan, 2002).

One of the first actions necessary to address the disease state of chronic viral hepatitis is to determine if there are a sufficient number of patients that would prompt the need for a DMO within a specific service area. The service area must be specifically targeted for outreach efforts, enrolment processes and identifying the status of patients (voluntary/mandatory). This process can be established from recommendations cited in preventive strategies: primary and corroborated with current county, state and national data.

Deciding on a service area and applying those steps only sets the stage for planning, but does not provide the knowledge needed for decisions about patient care. For example, a fundamental premise of the increased value to patients that is critical to a DMO objective can be formulated as the concept of 'the information hierarchy' (Porter et al., 2006). This hierarchy is exemplified by a triangle whose base comprises data retrieved from patient attributes. It is the information about the patient that is most important for treatment decisions. For the treatment prospects for chronic hepatitis patients, Ghany et al. (2009) specify a general list of accepted negative predictive values (NPV) and positive predictive values (PPV) that have also been quantified by Yu et al. (2007). Ghany et al. consider the NPVs to include ethnicity, such as African-American/Hispanic versus the PPV of Caucasian. Other examples of NPV/PPV include male versus female; high versus low body fat; high cirrhosis and scarring versus low or none; and overweight versus weight proportional to height. Most of this information can be retrieved in non-invasive ways, yet the information that would help to determine the best locations for facilities is often withheld or is not consistently and systematically determined. This obstacle can be overcome by using data accumulation protocols on the patient information noted above for both general health and specific disease indicators. The protocols are intended as well to establish knowledge that can advance treatment (Porter et al., 2006).

Once the base of the information hierarchy with relevant patient attributes is established, successive layers of information will include methods of treatment by medical professionals, cumulative experience of those delivering patient care and the patient outcomes, as well as the costs of treatment, summed up as patient results. Medical practitioners stand to benefit from a knowledge base from which they can learn in order to improve their patients' outcomes. The knowledge structure would reduce the risk of

misdiagnosis and other preventable errors by its evidence-based translation of data-to-information, to knowledge that elicits the changes in the structure of healthcare that Wan (2002) and Porter et al. (2006) have called for.

Porter et al. believe that a 'care delivery value chain' would be developed 'around medical conditions' and that healthcare, fuelled by empowered physicians, nurses and other medical personnel, could reduce costs through condition-treatment models developed from the 'information hierarchy', achieve 'service satisfaction' by reducing 'medical complications' and errors, formulate 'new pricing strategies' as a result of cost savings through mitigated risk and increased medical capabilities, and deliver 'overall medical satisfaction' through the 'full cycle of care'.

#### *4.2 Management*

DMO administrators must establish and enforce criteria for: demonstrated experience, expertise and capacity for chronic disease management; ability to serve the expected volume of patients with qualified personnel; resources and infrastructure capability. The latter includes the capability for assessment/risk screening, individualised care plans, case management, establishing best practices, cultural and ethnic competency, monitoring compliance, education and accountability.

Wan (2002) and a plethora of advocates press for a transition to evidence-based policy making that can 'best be achieved by formulation of national strategies' including statistical protocols (Scott, 2005). The 'statistics movement' requires management to capture health informatics that promote actions serving the best quality of life and patient health through sustained chronic disease management, discernment of future needs, patient-centred medicine and training existing or attracting new personnel to function under the new criteria.

Arrow et al. (2009) led a diverse group of healthcare industry professionals: physicians, health insurance executives, business leaders, economists and other major stakeholders in eight workshops as part of the 'FRESH-Thinking project', whose aim was an interdisciplinary approach to the challenges of health reform. Reformation of the delivery system is a starting point for practical healthcare reform and is consistent with a DMO approach. The eight objectives that emerged from the group collaboration can be pursued through a structural framework for healthcare that follows the actual guiding principles of a DMO.

The eight objectives of the FRESH-Thinking workshops are: payment systems that are more consistent with patient outcome measures; establishment of an independent agency qualified to evaluate through research, the effectiveness of drugs and devices and also treatment recommendations; reduction of the complexity of competing state laws and federal regulations, to coordinate care; health information technology infrastructure conducive to national information sharing; a national data repository with contributions from and access to healthcare stakeholders; funding to subsidise healthcare coverage by identifying revenue streams and formulating protocols for caps on tax exclusions for employer-based insurance; pooled insurance risk across untraditional boundaries and finally, the creation of a healthcare coverage board to continually examine the diverse stakeholder interests in healthcare reform.

### *4.3 Outcome tracking and evaluation*

A DMO's processes would support performance monitoring through the stages of healthcare, and would elicit the formation of metrics on those processes as a course of action expected to result in evidence-based measures of success, recourse for unsatisfactory performance and performance guarantees based on expected levels of compliance. Health informatics will play a significant role in developing performance criteria for management of chronic diseases such as viral hepatitis. However, formulation of those metrics requires systematic cooperation with other medical care facilities to identify data on healthcare. The external data include the numbers of hospital emergency room visits, hospital inpatient stays, hospital outpatient visits and physician office visits; drug use and fluctuations in laboratory test results. Examples of metrics are the reduction in emergency room visits related to chronic hepatitis, compliance with recommendations for drugs and patient personal biometrics indicating cost reductions from patient behaviour modifications achieved through patient/clinical partnerships.

Ultimately, disease management programmes should visibly improve quality of life for patients with chronic disease by delivering more effective and efficient care through strengthened relationships with community stakeholders. Community collaboration efforts across agencies at the private, local, state and national levels should generate objective data to assist clinician management, create guides for medical interventions and help to identify triggers. Observing and compiling data should be a high priority, their transparency must be disseminated across previous medical boundaries to facilitate cost reductions.

### *4.4 Policy reform and public financing*

Stronger relationships with community stakeholders at various levels should provide the collaborative platform for the research and development to launch and sustain a DMO. Moreover, the collaborative efforts can open the gate to shared resources and pooled information, so that costs and risk are distributed. As research increasingly quantifies community needs, advocates for those who need long-term treatment for chronic diseases like viral hepatitis will be able to give policy makers knowledge that elicit their support for agencies serving such patients. Ultimately, funding should go to entities that adhere to guidelines that produce good patient outcomes, besides contributing to national data repositories that aid policy making.

AbouZhar et al. (2007) offers a 'fourfold framework to help the transition from data to policy' that funding sources could use. The transition required to establish and maintain an organisation like a DMO begins with the reconciliation of divergent statistical sources. Policies that 'foster communications and transparency' begin with protocols for inter-organisational exchange to develop standard data fields. Like Scott (2005), AbouZhar et al. advocate 'country ownership of data and statistical analysis'.

What is most relevant to strategy for good practices is to eliminate 'conflicts of interest, including those arising when workers responsible for attainment of health goals are also charged with measurement and monitoring of progress'. AbouZhar et al. offer a solution that is easy to implement considering the complexity of the internal/external situation for which it was developed. As in the Wan (2002) and Porter et al. (2006)

strategy, AbouZhar et al. further quantify 'primary data collection across a full range of sources but also in building capacity in countries to analyse, interpret and present statistics in ways that are meaningful and useful for policy making'. These strategies are consistent with the DMO in that they do not ignore national interests in favour of local treatment processes. Instead, they develop local patient services but also build national health informatics metrics that could cumulatively reduce healthcare costs.

With the reconciliation of data and the formation of a national repository, government funding to support health information research should come from current funding for healthcare reform. This approach, besides supporting patient care by DMOs and activities to achieve healthcare objectives for the US population, would methodically reduce the burden of healthcare costs through a national knowledge repository. Thus, cost effective, appropriate care would be possible in areas hard hit with the need for chronic disease management, as for chronic viral hepatitis in Central Florida.

## **5 Concluding remarks**

A recurring theme of US healthcare is the arduous task of insuring access to healthcare for all US residents, a task now being tackled by the Obama Administration. The cost control measures advocated by Obama, however, would reduce the profits of the healthcare industry. Opponents of such profit containment view it as a backward-looking idea. They point to the Clinton Administration's similar attempt that failed despite the best intentions (Marmor et al., 2009). Further, reducing the profits of insurance companies and healthcare companies would undercut the promised 'change' by undermining the tax base in business.

Under the pressure to control healthcare costs, undirected government money is allocated to healthcare reform often without either immediate or long-term objectives to ensure that as costs are reduced, the quality of health is not damaged. Furthermore, government funding requires changes in clinical administration that reduce operating costs and find ways to reduce the growing need for chronic disease management. Like many other US corporations that expanded beyond their competency in the last 20 years to ultimately founder and undergo downsizing that shrank capabilities (Budros, 2002), the healthcare corporations must come to grips with the reality that their administrative policies and behaviours fall far short of current medical and technical superiority. The present development of health information technology and electronic medical records is an important part of the remedy. But, healthcare plans that do not consider the long-term economic survival of healthcare facilities and therefore information sharing founded on health informatics research, will be remiss. Equally remiss would be mechanisms that did not require the dissemination of that information to enrich treatment. Changes that do not incorporate those considerations will not achieve the large scale cost reductions needed. However, translation of data and information to usable knowledge applied in DMOs will focus on patient needs, but also respect the medical community and protect the solvency of healthcare corporations and medical professionals.

National healthcare objectives must consider core competencies and the traditional aim of healthcare – make the patient better! DMOs shaped by original criteria and furnishing outputs to a national knowledge repository for models of the best treatment will complete cycle of care for long-term quality and attention to patient needs as well as successful corporate operation. This approach should shift the relationship between

patients and medical personnel from financially motivated decisions about medical care to an increasingly patient-centred focus. The good news is that clinical administration can expect to see an improvement in the financial bottom line because patients will accept responsibility for adherence to medical regimens such as prescriptions and for the cessation of deleterious behaviour such as smoking that contribute to chronic conditions.

The expectation that such objectives will favour financial bottom line rests on two assumptions:

- 1 DMO operations include evidence-based practices will produce the best healthcare information and consequently, the best treatments
- 2 the cumulative effect of best treatment choices derived from comparative effectiveness studies will reduce costs because the risks from common medical errors will be less, and patient accountability in long-term care will also improve the patient's health status.

Such long-term care illustrated above has the substantive essence to improve the quality of life which cannot be achieved from the current and costly practice of a series of visits to the hospital emergency room.

Health informatics research is a critical foundation for DMOs and vital for cost-effective alternatives to hospitals, because those often provide a range of costly services. The hospital can eliminate the need for costly and preventable hospital emergency room treatment as the DMOs monitor and provide financial and medically sustainable treatment programmes of consistent care for patients with the complications of chronic disease. Health informatics provides a complete cycle of information necessary for programme development, planning, provider services, patient/provider education and evaluation of services to that at-risk population through the original principles of a DMO.

Therefore, increased government funding should go towards developing DMOs whose objectives include the creation of a shared national data repository for best healthcare. The progression of this approach will achieve cost reductions and eliminate healthcare burdens like the overuse of costly emergency room services. Hospitals and other healthcare services will eliminate waste in response to the increase in their options for more cost-effective healthcare.

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