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NIH Consensus Statement Embraces Universal Management, Treatment & Care

Statement is Widely Used by Healthcare Providers In Treatment Decisions

By Alan Franciscus
Editor-in-Chief

The National Institutes of Health held the second Consensus Development Conference on Management of Hepatitis C on June 10-13, 2002 in Bethesda, Maryland.

The first Consensus Conference on Management of Hepatitis C was held in March 1997 and established the current approaches to the management and care of HCV. The 1997 consensus statement on hepatitis C has been widely utilized by medical providers to make treatment and care decisions, by insurance companies for reimbursement decisions and by government agencies and healthcare agencies in the development of guidelines and algorithms for HCV management.

The knowledge and understanding of hepatitis C has been so profound in recent years that in many regards the above decisions were based upon guidelines that rapidly became antiquated after being established. In the past five years there have been remarkable advances that have affected the information included in the consensus statement on the management of HCV such as natural history, transmission, diagnosis, and treatment.

In many respects this conference is long overdue especially since treatment has evolved from the disappointing results with interferon monotherapy

(genotype 1 - 9% sustained virological response (SVR); genotype 2 & 3 - 30% SVR.) to combination of interferon and ribavirin (genotype 1 - 29% SVR; genotype 2 & 3 - 62% SVR) to the latest advances with pegylated interferon(s) in combination with ribavirin (genotype 1 - 42-51% SVR; genotype 2 & 3 - 76-82% SVR) with the convenience of once a week dosing. As it relates to treatment response rates, one speaker commented that when looking at the difference in genotype treatment responses from high response rates in genotype 2 and 3 to modest treatment response rates in genotype 1 it "seems like they are two different diseases" and reminds us that when discussing SVR, response rates should be listed separately by genotype as overall SVR basically means very little. It should also be noted that management of treatment related side effects have made important strides, which have helped to improve adherence to therapy and thus treatment response rates.

Additionally, HCV antibody tests, viral load tests and the management of treatment side effects have all made important strides to increase treatment response. These recent advances in the understanding of hepatitis C as well as the populations that HCV affects more than warrant these much needed changes.

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The HCV Diagnosis: Crisis or Opportunity?

By Lucinda K. Porter, RN, CCRC

A diagnosis of chronic hepatitis C virus (HCV) infection usually stirs up a range of emotions. People react differently upon hearing this diagnosis. Some people respond with denial, dismissing the possible implications of carrying the HCV virus. Anger is another common reaction.

People are often frightened, especially since they know little about HCV, the treatment, or the possible consequences of having a virus take up residence in their liver. For some, an HCV diagnosis can be a pivotal point.

A chronic illness may bring up issues of life and death, and the realization that life is indeed short. In the majority of people, HCV will run a benign course. These people will die with an HCV infection and not from an HCV infection.

However, the diagnosis itself is never benign. Human beings are not prepared to be told “bad news.” Although life throws those proverbial curve balls at us, by in large we expect life to go well. The will to live is innate and being told we have a virus that can lead to liver damage, cirrhosis, and possibly death challenges every morsel of life.

Or does it? I met a man recently in the cafeteria at Stanford Hospital. We struck up a conversation and within a few minutes he disclosed to me that he had recently been diagnosed with a very aggressive form of cancer. He had decided to undergo an intense treatment regimen. This man explained to me that he had learned to live his life by conquering difficult challenges and this was just one more. Since his diagnosis he had completed a marathon and climbed Mt. Rainier.

The determination he expressed seemed equal to the fear he felt. There was room for fear and bravery to coexist in his heart. This man made a deep impression on me. Why did he act with obvious courage rather than defeat? What could I learn from him that would be useful for my patients as well as for myself?

Coping is a learned behavior. Humans learn how to react to life through their family and other social structures. Some learn to view hardship as something to conquer; where even the smallest obstacles defeat others. Learned behaviors can be unlearned, modified,

or replaced by more effective skills. Here are some suggestions of how to weather hard times.

Avoid isolation. Self-absorption and self-pity are common reactions to crisis, but left unattended, can make matters worse. Find support through family, friends, support groups, clergy, or counseling.

Examine your inner voice. What are you saying to yourself? Are you saying, things are never going to get better? Or are you saying this will pass? Are you saying, I can't deal with this? Or are you saying, this feels awful, but I will learn to deal with it?

Skip the guilt. If you acquired HCV by way of a voluntary act, such as through past injection drug use or failure to practice universal precautions, then self-blame may be an issue. Guilt can be self-destructive. Forgive yourself and move on.

Take control. The diagnosis of chronic HCV infection is an unwanted discovery. Loss of control over health and the future are natural feelings that arise. Feeling powerless can cause a downward spiral. The remedy to this is to regain control. Ask yourself what you can control. In general, humans can control what they eat, drink, their level of activity, stress, and attitudes. After you have identified what you can control, then ask yourself how you will do this.

Make a commitment. Once you have identified how you can control your life, make a commitment to do this. Renew this commitment on a regular basis.

Look for inspiration. Many people have survived far worse circumstances than an HCV diagnosis. Some examples are prisoners of war and concentration camps, victims of violent crimes, and survivors of various atrocities. Find books, articles, and opportunities to hear their stories. Learn from their wisdom.

Help others. Helping others prevents self-absorption and self-pity. The most resilient survivors of the Nazi death camps were those who helped others. Learning to master crisis is not an overnight process.

Be gentle with yourself. A favorite quote of mine is from an unknown author, “Concentrate on what you want to become, not what you are trying to overcome.”

HealthWise

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Fibrosis, Cirrhosis, and Steatosis

By Liz Highleyman
Contributing Editor

Although many people with chronic hepatitis have few or no symptoms and minimal liver disease progression, others will go on to develop serious liver damage. This typically takes several years or decades. It is estimated that 10-25% people with chronic hepatitis C will develop cirrhosis after 20-30 years; for people with chronic hepatitis B infection, the estimated rate is 20-30%.

Advanced liver damage may include fibrosis, cirrhosis, and steatosis. These conditions can result from various types of liver injury, ranging from viral infection to exposure to alcohol or other toxic substances. The hepatitis C and B viruses (HCV and HBV) attack liver cells (hepatocytes), where they multiply, or replicate. HCV and HBV cause liver inflammation and kill liver cells (necrosis). Inflammation is an immune response to infection or injury characterized by the infiltration of white blood cells. The degree of liver inflammation is often reported in terms of grades—from 0 to 4—or may be described as mild, moderate, or severe.

FIBROSIS

Fibrosis refers to the development of fibrous scar tissue within the liver and occurs when the normal processes involved in tissue repair get out of control. The death of hepatocytes stimulates inflammatory cells to release cytokines and other chemicals, which cause fibroblasts to form around injured hepatocytes and synthesize fibrous tissue, a process called fibrogenesis. Hepatic stellate cells have been shown to play a key role in this process. Collagen, various glycoproteins, and other components are deposited within the liver. This connective tissue makes up the extracellular matrix (the structure between cells) in healthy livers, but it proliferates excessively in people with fibrosis. In addition, the liver's normal ability to break down matrix tissue (fibrolysis) may be impaired, leading to further collagen build-up. Fibrosis can obstruct blood flow in the liver, lead to further hepatocyte atrophy and death.

Bridging fibrosis occurs when new linking blood vessels form in an attempt to restore circulation and fibrotic tissue extends beyond one area (or portal) of the liver. Over time, fibrosis may progress to cirrhosis.

CIRRHOSIS

Cirrhosis is a process in which the normal liver architecture (structure) is altered by the formation of regenerative nodules surrounded by scar tissue and fibrous membranes (septa), in an attempt to repair the damaged organ. Liver cirrhosis may be classified by the size of the nodules: micronodular (small nodules less than 3 mm in diameter), macronodular (large nodules over 3 mm), or mixed. The build-up of scar tissue usually progresses over time as long as the source of liver injury remains. Eventually, abnormal cell proliferation may lead to hepatocellular carcinoma, a type of liver cancer.

Compensated cirrhosis occurs when the liver is scarred but can still work relatively normally; people with compensated cirrhosis typically exhibit few or no serious symptoms. Decompensated cirrhosis occurs when the liver is so damaged that it cannot function properly. The Child-Pugh scoring system is used to grade the severity of cirrhosis based on symptoms.

Because the liver is responsible for so many important functions, liver damage can have wide-ranging effects. Extensive scarring can impair the circulation of blood through the liver, leading to portal hypertension, or high blood pressure in the vessels that serve the liver. This in turn can lead to the development of varices (stretched and weakened blood vessels) in the esophagus and stomach, which may burst and bleed. If the damaged liver is unable to synthesize adequate albumin (a blood protein), fluid may accumulate in the abdomen, a condition known as ascites. Inadequate production of clotting factor by the liver can lead to prolonged bleeding and easy bruising. If the liver's filtering and processing ability is impaired, metabolic by-products, hormones, and other substances may accumulate in the body. Some people with decompensated cirrhosis experience jaundice (yellowing of the skin and whites of the eyes), dark urine, and pale-colored stools as bilirubin levels increase. The build-up of bile acids in the body can cause pruritis (itching). An accumulation of estrogen can lead to spider angiomas (clusters of dilated blood vessels in the skin) and gynecomastia (breast enlargement in men). The build-up of toxic substances such as ammonia can affect the brain causing hepatic en-

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Cirrhosis

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cephalopathy, characterized by mental impairment, confusion, lethargy, personality changes, mood swings, and even coma. In the most severe cases, frank liver failure may occur, necessitating a transplant.

STEATOSIS

Steatosis refers to the accumulation of fat within liver cells. It is often associated with heavy alcohol consumption, but also occurs in people who drink little or no alcohol (nonalcoholic steatosis). Studies have shown that steatosis occurs in 30-70% of people with chronic hepatitis C, although it is not yet known whether HCV infection itself is directly responsible. The relationship between liver steatosis and conditions such as obesity, high blood fat levels (hyperlipidemia), insulin resistance, and diabetes is not well understood, but is currently under study. Recent research indicates that people with steatosis are at risk for more rapid development of fibrosis and cirrhosis. Several factors impact the rate of liver disease progression, including alcohol consumption (which accelerates progression), sex (men develop liver damage more rapidly than women, possibly due to a protective effect of estrogen), age (younger people progress less rapidly than older people, especially those over age 50), duration of infection, and possibly HCV genotype shown only in a few small trials.

ASSESSING LIVER DAMAGE

Liver damage and dysfunction may be indicated by clinical symptoms and by abnormal lab test results, including elevated levels of certain liver enzymes (especially alanine aminotransferase, or ALT),

reduced levels of serum albumin, and prolonged prothrombin time (a measure of blood clotting efficiency). However, some people with liver damage experience few symptoms and have persistently normal lab results. New, noninvasive methods for assessing liver disease progression are under study, including tests that measure levels of collagen by products and cytokines in the blood that may be markers for fibrotic activity.

The "gold standard" for assessing liver disease status is biopsy, in which a small sample of liver tissue is withdrawn, stained, and examined under a microscope for evidence of tissue damage. Liver biopsy results are reported in terms of histological stages (alternative staging and scoring systems, such as the Knodell Histological Activity Index, also may be used). Unlike the inflammation score—which reflects current disease activity—these stages reflect degree of established liver damage. Stage I refers to liver inflammation without fibrosis. Stage II is inflammation plus fibrosis confined to one portal of the liver. Stage III indicates that fibrosis extends over adjacent portals (bridging fibrosis), but nodules are not yet present. Stage IV is cirrhosis with loss of normal liver architecture. People progress through these stages at different rates; often people have early or moderate fibrosis for many years without developing cirrhosis.

TREATMENT AND FUTURE PROSPECTS

Research indicates that effective treatment with interferon and ribavirin as well as lamivudine for HBV can slow or halt liver disease progression, and may actually allow for some degree of repair and

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Book Review: The First Year™

By Alan Franciscus
Editor-in-Chief

The First Year™ Hepatitis C: An Essential Guide for the Newly Diagnosed by Cara Bruce and Lisa Montanarelli

This is a very thorough, patient friendly book that is specifically geared towards the newly diagnosed HCV positive person and contains constructive steps to guide the reader to a thorough understanding of HCV.

What is so helpful about this book is that it contains a wealth of information on HCV and offers a step by step practical plan for people to follow that will help them regain a measure of control in their lives and effectively manage the disease which they have been newly diagnosed without feeling totally overwhelmed.

This book is an obvious labor of love by two HCV positive women who share their unique techniques that have helped them move forward after their initial diagnosis and consequently effectively manage their disease.

The book offers a step by step guide broken into daily, weekly and monthly time increments. Each section consist of two parts: "Living," this gives advice on dealing with the practical and emotional consequences of HCV and "Learning," which gives educational information that one needs to be famil-

iar with in order to become their own health advocate.

For instance the first section is 'Day One' – Living— So You have Hep C. What Now? This section focuses on strategies that will help one come to terms with the emotional issues accompanied with their new diagnosis.

The second section for 'Day One' is Learning—the companion hepatitis C educational piece. This section helps the reader understand the very basic facts about hepatitis C. The entire book is set up in this style and gradually moves the reader through all the issues regarding transmission, prevention, disclosure, lab tests, symptoms, conventional and complementary therapies and much more. The design of the book is like attending a workshop where the amount of information given, both written and practical exercises is at a pace that one can assimilate.

Additionally, a very important aspect of this book is that it gives the reader a sense of hope and the skills necessary to begin the process of accepting their diagnosis of HCV. Lastly, the book also gives additional information on specific populations such as children and HIV/HCV coinfection plus a valuable list of resources.

The only minor criticism I have of this book is

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THE CONSENSUS PANEL AND THE PROCESS

The consensus panel is made up of individuals chosen because they do not have any vested interest or financial gain in the outcome of the consensus statement. They are responsible for reviewing all the data presented and issuing a preliminary statement. The preliminary statement is then presented to the conference attendees for discussion and with additional input the final guidelines are issued.

Statement from National Institutes on the Consensus Procedures:

NIH Consensus Statements are prepared by a nonadvocate, non-Federal panel of experts, based on (1) presentations by investigators working in areas relevant to the consensus questions during a 2-day public session; (2) questions and statements from conference attendees during open discussion periods that are part of the public session; and (3) closed deliberations by the panel during the remainder of the second day and morning of the third. This statement is an independent report of the panel and is not a policy statement of the NIH or the Federal Government. The statement reflects the panel's assessment of medical knowledge available at the time the statement was written. Thus, it provides a "snapshot in time" of the state of knowledge on the conference topic. When reading the statement, keep in mind that new knowledge is inevitably accumulating through medical research.

NIH CONSENSUS GUIDELINES

Highlights from the NIH Consensus Statement - The Preliminary Report

Epidemiology

The number of people that have been infected with HCV has been estimated at being 3.9 million. This number is estimated from an NHANES prevalence study, which is a population-based household survey that largely excludes groups with a substantially increased prevalence for HCV infection, such as persons who are incarcerated, the homeless or those institutionalized due to mental illness. The NHANES study has grossly underestimated the prevalence of HCV and this has had significant negative effects since government fund-

ing decisions are driven by disease prevalence. The NHANES study numbers are included in the consensus report along with a statement on the study flaws mentioned above. It was suggested by the audience that a new prevalence study be conducted to address the actual number of HCV infections so that in the future better decisions and government budget-allocation can be made from more accurate facts.

Chronic Infection and Disease Progression

In the 1997 Consensus Statement, the rate of acute HCV infections that went onto chronic disease was listed as 85%. New studies have indicated that the originally quoted number of 85% is too high and is now believed to be between 55-85%. In addition the 1997 statement listed that 20% of people with HCV would progress to cirrhosis after 20 years. This information was based from retrospective studies, which we know are misleading. A more accurate assessment through prospective studies on the probability of the rate of disease progression has since been done showing that the rate of disease progression from chronic HCV infection to cirrhosis in 20 years is about 2-3 percent. The prospective studies were done on specific populations such as Hemophiliacs and therefore may not be representative of the overall HCV population. The actual true number is probably somewhere in between and is duly noted in the new statement.

Diagnostic Approach

Antibody Tests

The statement notes that HCV antibody tests have become much more sensitive since the original document with increased sensitivity to 99% and specificity of 99% thereby reducing the need for the confirmatory RIBA antibody test in most populations. This will also affect reimbursement for these tests. Viral load tests information on Qualitative and Quantitative Assays (viral load tests) were updated in the new statement and it was noted that the sensitivity of these tests has improved and there is now a recommendation that these tests be standardized to report in international units, which is now mandated by the FDA before marketing approval. The transcription-mediated amplification

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(TMA) viral load test which is now available is more sensitive and less expensive than the current viral load tests.

It was reported that the above tests should only be used for confirmation of active infection and that the quantitative test has value mainly in monitoring HCV treatment as a decline in viral load is associated with a better treatment response. Reference was made to the use of ALTs to monitor general disease progression and to a lesser degree treatment response. Inclusion of this information in the consensus statement will have important impact on insurance reimbursement.

Liver Biopsy

The new consensus statement will include language recommending liver biopsy as well as a reminder that a liver biopsy yields information about the health of the liver that is not obtainable by any other means. The statement also notes that a liver biopsy can give information that allows for an infected individual the opportunity to make informed choices about the initiation or postponement of HCV antiviral treatment as well as being an important benchmark for future comparisons. This is another important area for insurance reimbursement since up until now there have been no recommendations for the usefulness of this procedure.

Hepatocellular Cancer (HCC) Screening

The report noted that HCC occurs after the development of cirrhosis at a rate varying from 0 to 3 percent per year, but that there have been only a few studies that look at special screening in patients with advanced HCV. Screening with alpha fetoprotein (AFP) and ultrasound every 6 months did not significantly increase the identification of HCC and the panel recommended that new studies are needed to identify new markers and tests that can be used for HCC screening.

HCV Therapy

The new consensus statement will incorporate information about the advances in effectiveness of combination therapies (standard interferon/pegylated interferon plus ribavirin) to treat HCV positive naïve patients with an emphasis on the increase in response rates with pegylated interferon plus ribavirin and the

importance of genotype testing when making treatment considerations. It was suggested by an audience member that a record should be included in the statement that states that there is still a beneficial role for combination therapy with standard interferon (Intron A, Infergen or Roferon) in combination with ribavirin for some populations. For example, it was shown that the majority of populations in prospective studies with the first available pegylated interferon (alfa 2b) get no additional improved efficacy over standard interferon in combination with ribavirin. The populations that gained no efficacy advantage over standard interferon combination included genotype 2 and 3 patients as well as genotype 1 patients with a high viral load (>2 million copies/ml). There is however a benefit in the convenience of the once weekly dosing for all patients with pegylated interferon. Additional information was included on the difficulty of treating previous relapsers and non-responders in general. The panel recommended that current and future studies evaluate retreatment. There was also a suggestion to look into the possible value of long term pegylated interferon therapy to stop or slow down HCV disease progression in this challenging patient population which still, even with advances in therapy, continues to represent approximately 40% of the treated HCV population.

Side Effects of Treatment

In most cases treatment side effects can be successfully managed and the strong recommendation is that patient education is critical. Side effect management of anemia and different cytopenias (low platelets, low white blood cells) with adjunctive therapies are mentioned but what was absent was a caution that these therapies to date have not been shown to have treatment outcome efficacy in HCV to properly justify their use and the additional high costs associated with their use.

Who Should Be Treated?

This is the most important statement in this report. Previously in the 1997 Consensus Statement, the recommendations for treatment were made related to specific populations and excluded many patient groups. For example, exclusions were written in the 1997 Statement as follows: "treatment of patients who

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are drinking significant amounts of alcohol or who are actively using illicit drugs should be delayed until these habits are discontinued for at least 6 months. Treatment for addiction should be provided prior to treatment for hepatitis C.” In addition to automatically excluding anyone that uses alcohol or drugs, many healthcare providers interpreted these recommendations to also exclude methadone maintenance patients from therapy.

Additionally this statement opens the door for treatment consideration for many patients with acute HCV, normal ALTs, children, HIV/HCV coinfection, post transplant and many other groups. This statement is extremely important for treatment consideration and insurance reimbursement issues.

Transmission/Prevention

This is also an important change because it spells out the current transmission risks from high (blood contact from IDU use) to moderate to low risk (sexual, vertical, tattoo, piercing, occupational, and household exposure).

This statement really puts into perspective what patients are most worried about and that is sexual transmission of HCV to their partner. More studies however need to be done on sexual transmission that will provide data on transmission rates by specific sexual practices. It was also noted that HIV/HCV coinfection increases the risk of sexual and vertical transmission.

HIV needle and syringe exchange programs and comprehensive prevention education programs that may help stop the spread of HCV were discussed. Inclusion of information on needle and syringe exchange programs should help to boost support and funding for needle exchange and prevention education nationally.

Recommendations for Future Research

The consensus panel made many recommendations for specific future research and education that will drive critically important new studies. They also recommended the establishment of a hepatitis research network that would conduct research into the natural history, prevention, and treatment of hepatitis C. Most importantly these recommendations will help to support funding for needed research and education.

In conclusion, the NIH Consensus Conference on

the Management of Hepatitis C: 2002 is historic in that it has the potential to dramatically expand and increase the awareness of HCV, impact the management and care of patients with HCV as well as drive future funding-initiatives for this currently underfunded and often ignored disease. The final statement will be issued soon and we will update any changes at that time.

Cirrhosis

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reversal of existing damage, especially if it is not yet advanced. Ongoing research may lead to the development of therapies that directly inhibit the fibrotic process. Experts traditionally have discouraged treatment of people with decompensated cirrhosis—because interferon, in particular, can lead to a worsening of liver inflammation—but some studies suggest that treatment of such people may in fact be beneficial. New combination regimens and drugs in the development pipeline (such as adefovir for chronic HBV) show promise. At this time, participation in a clinical trial may be the best option for people with advanced liver disease.

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Book

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that it may be too exhaustive for the average patient. If followed thoroughly the tasks outline in the book could almost be a full time job in itself. As I stated above the information is delivered like attending a workshop but the problem though is that for the average newly diagnosed patient they have a working life, a family life etc. and can't just take on their new diagnosis as if they were at a workshop! I would advise people to use this book at their own pace and use it as a valuable tool to learn and grow.

With that advice in mind, I am the first to acknowledge that living with a chronic illness such as HCV does require hard work and commitment to fully understand the new life that you are taking on as a person with HCV. This book is an excellent addition to any Hep C library and I would definitely recommend it to anyone affected by HCV.

Hepatitis C and Injection Drug Users - Part One

By Alan Franciscus
Editor-in-Chief

Injection drug users constitute the largest group of persons in the United States who are infected with HCV and also account for the majority of new HCV infections. Of the 15 million Americans who currently use drugs, an estimated 1.0 to 1.5 million inject them. Studies on injection drug users have shown, through serological testing for antibodies to hepatitis C that between 36% and 95% of injection drug users have been exposed to the hepatitis C virus.

Injecting with someone else's potentially contaminated needle and syringe, known as "needle borrowing or sharing" is the principal risk factor for HCV among IDUs. An important study in Baltimore in 1988 and 1989 found that IDUs became anti-HCV positive very rapidly after initiation of injecting: 65% were infected within 1 year and 77% were infected within 5 years of first injecting.

For this reason young IDUs, who tend to be recent initiates to injecting are an important group to screen for HCV. Young IDUs who began injecting after the establishment of NEPs (needle exchange programs) may have a lower HCV infection rate than the IDUs who began injecting before that time. Declines in the number of acute HCV infections in the 1990's may be because of safer injecting practices among IDUs.

However, despite increased access to sterile needles, young IDUs may still be at high risk for HCV infection because of other risky behaviors. Young IDUs report more frequent needle sharing than older IDUs and sharing of drug preparation tools such as cookers and cottons. HCV-RNA has recently been isolated from injection preparation tools and two recent studies have found an association between sharing such equipment and HCV infection.

Many street youths who inject drugs also engage in high-risk sexual activity. Therefore, in addition to parenteral risk, young IDUs may engage in behaviors that have been suggested as risk factors for HCV including unsafe sex, tattooing, body piercing and intranasal drug usage.

To date, estimates of the prevalence of HCV in young IDUs have ranged from 27% to 81%. Recent

estimates of incidence rates among IDUs under age 30 were 16 and 23 per 100 person years (%py) in Baltimore and Sydney respectively. Incidence estimates among younger IDUs were 76 per 100 person years (%py) among IDUs under 20 years old in Sydney and 23 per 100 person years (%py) among IDUs under 25 years old in Seattle.

In San Francisco the prevalence of anti-HCV in IDUs under 30 years old was 45% overall rising from 9% in those who had been injecting for less than 2 years to 78% in those who had been injecting for 10 or more years (88% of people studied in San Francisco had used NEPs or other needle exchange mechanisms). The overall HCV incidence rate was 11 per 100 person years (%py) which is considerably lower than previous reports due to the fact that a good majority of the younger population started injecting in the era of harm reduction.

The incidence of 11 per 100 person years of injecting means that half of injectors will be infected after 5 years of injecting and 72% will be infected after 10 years of injecting. The data shows that although young injectors in most cities have access to clean injecting equipment and the HCV seroprevalence and incidence are lower in young IDUs than older IDUs there is still ongoing transmission of hepatitis C.

Therefore, interventions to prevent HCV infection in this population are needed. Interventions targeted to the newest injectors will reach the largest number of recently infected young IDUs, however the constant incidence rate shows that young IDUs are susceptible at all points of their injecting career. Even in cities where the most widely implemented harm reduction intervention, needle exchange is used by a high proportion of young IDUs, the use of these venues has not been associated with avoidance of "needle borrowing". In addition to needle exchange education, research needs to be continued to examine behaviors that might cause HCV infection in the absence of "needle borrowing", such as all sharing activities used in injection drug practices.

Part Two will be in the August issue.

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