Health care-associated viral hepatitis C

Assoc.Prof.Rossitza Vatcheva-Dobrevska, MD, PhD
National HAI Reference Centre
National Centre of Infectious and Parasitic Diseases

VHPB-Country Meeting on “Burden and Prevention of Viral Hepatitis in Bulgaria”
Sofia, March 24-25, 2011.
Chronic hepatitis C is the most common cause of chronic liver disease and cirrhosis, and the most common indication for liver transplantation in the United States (U.S.), Australia, and most of Europe.

Approximately 170 million people are affected with HCV worldwide, comprising ~3% of the global population.

8,000 - 10,000 deaths per year

Hepatitis C virus (HCV) is the most common chronic bloodborne infection in the U.S., and is involved in 40% of chronic liver disease.

HCV Facts

- HCV was initially isolated from the serum of a person with non-A, non-B hepatitis in 1989 by Choo et al.
- Shortly after the cloning of HCV, this newfound virus was discovered to be the cause of approximately 90% of non-A, non-B hepatitis in U.S.
- **HCV is a blood-borne virus**

**The Virus**
- Single stranded, positive sense, RNA
- Flaviviridae family
- Spherical, enveloped
- ~ 50 nm

Choo, Science 1989; 244: 359-62
HCV replicates in the cytoplasm of hepatocytes, but is not directly cytopathic.

Persistent infection appears to rely on rapid production of virus and continuous cell-to-cell spread, along with a lack of vigorous T-cell immune response to HCV antigens.

The HCV turnover rate can be quite high and a predicted viral half-life of 2 to 3 hours.

HCV - Genetics

HCV has six major genotypes, numbered 1-6.

- Multiple subtypes, a, b, c, etc., more than 50....
  - Further divided into quasispecies, varying in RNA sequence by 1-9%

- RNA sequence may vary by 35% between genotype

- Great genetic diversity

Farci, Semin. Liver Dis 2000;20:103-26
The rapid viral replication and lack of error proofreading by the viral RNA polymerase are reasons why the HCV RNA genome mutates frequently.

Frequent HCV mutations and numerous subtypes have made the search for an HCV vaccine challenging.
Up to 80% of people initially infected with HCV may become chronically infected—that is, the infection does not clear up within six months.

Most people with chronic HCV do not have symptoms and lead normal lives.

However, in 10–25% of people with chronic HCV, the disease progresses over a period of 10–40 years, and may lead to serious liver damage, cirrhosis (scarring), and liver cancer.

There is currently no vaccine or cure for HCV, but various treatments can eradicate the virus and/or help slow or stop disease progression for some people.
Hepatitis C virus (HCV) is transmitted by percutaneous or permucosal exposure to infectious blood or blood-derived body fluids.

- **Risk factors** associated with acquiring HCV infection have included:
  - **transfusion of blood** and blood products
  - Person-to-person in **hemodialysis units**
  - **Organ and tissue transplantation** from infected donors,
  - injecting **drug use**, 
  - failure to sterilize medical equipment & unsafe injections
  - **occupational exposure to blood** (primarily contaminated needle sticks, unsafety injection practice), Nosocomial outbreaks reported
  - **birth** to an infected mother,
  - **sex** with an infected partner, and multiple heterosexual partners.
HCV - Risk factors

I. Transfusion - Before the screening of the donated blood for HCV was mandated, the most common route of acquisition of HCV was blood transfusion

- Dependent on prevalence in general population
- Screening methods and diligence in screening

- In the US, it dropped from 25% to 0.1% after initiation of screening
  - 1996 risk in the US was 1 in 103,000 units
- Current risks:
  - HCV - 1 in 1,600,000 units

- Today the likelihood of contracting HCV through infected blood is less than 0.01%.
Blood Supply Screening

- **Antibody based**
- **Antigen based**
- **Nucleic acid technology (NAT)**
  - Introduced in 1998
  - Reduces window period
    - For HCV: from 70 days to 10 days
    - For HIV: from 22 days (antibody) to 11 days
- Potential reasons for transmission
  - Window period
  - Immunovariant strains
  - Persistently antibody negative carriers
  - Testing errors

Adeel A. Butt, MD
Division of Infectious Diseases
University of Pittsburgh
Sharps injuries

- Exposure to blood and body fluids of patients infected with bloodborne pathogens, like HIV, hepatitis B virus (HBV) and hepatitis C virus (HCV), poses a risk of occupationally-acquired infection.

- The greatest risk is posed by percutaneous injuries (e.g., needlesticks and injuries from other sharp devices).

- Selecting, evaluating, and adopting safety devices requires collaboration among many individuals in the healthcare setting.

- To ensure a successful program, each healthcare facility and setting will need to tailor its approach to the specific risks and characteristics of the clinical environment and the needs and preferences of the workers.
Incorrect practices that have resulted in transmission of pathogens:

- Using the same syringe to administer medication to more than one patient, even if the needle was changed.
- Using a common bag of saline or other IV fluid for more than one patient, and
  - Leaving an IV set in place for dispensing fluid
  - Accessing the bag with a syringe that has already been used to flush a patient’s IV or catheter.
- Accessing a shared medication vial with a syringe that has already been used to administer medication to a patient.

Injection safety recommendations

- Never administer medications from the same syringe to more than one patient, even if the needle is changed.
- Consider a syringe or needle contaminated after it has been used to enter or connect to a patients’ intravenous infusion bag or administration set.
- Do not enter a vial with a used syringe or needle.
- Never use medications packaged as single-use vials for more than one patient.
- Assign medications packaged as multi-use vials to a single patient whenever possible.
- Do not use bags or bottles of intravenous solution as a common source of supply for more than one patient.
- Follow proper infection-control practices during the preparation and administration of injected medications.

Endoscopy Clinic: New York City, 2001

- 19 HCV infections likely due to contamination of multiple-dose anesthetic vials
In February 2008 the health district advised patients who received injected anesthesia medication at the Endoscopy Center of Nevada (700 Shadow Lane) of a risk for possible exposure to hepatitis C and other bloodborne pathogens.

The epidemiologic and laboratory investigation revealed that hepatitis C virus (HCV) transmission likely resulted from reuse of syringes on individual patients and use of single-use medication vials on multiple patients at the clinic.

Unsafe injection practices and circumstances that likely resulted in transmission of hepatitis C virus (HCV) at clinic A -Nevada, 2007

Unsafe Injection Practices and Disease Transmission

Reuse of syringes combined with the use of single-dose vials for multiple patients undergoing anesthesia can transmit infectious diseases. The syringe does not have to be used on multiple patients for this to occur.

1. A clean syringe and needle are used to draw the sedative from a new vial.

2. It is then administered to a patient who has been previously infected with hepatitis C virus (HCV). Backflow into the syringe contaminates the syringe with HCV.

3. The needle is replaced, but the syringe is reused to draw additional sedative from the same vial for the same patient, contaminating the vial with HCV.

4. A clean needle and syringe are used for a second patient, but the contaminated vial is reused. Subsequent patients are now at risk for infection.

A gastroenterologist notified the Office of Epidemiology at the Nebraska Health Department in Lincoln, Nebraska, of a cluster of 4 HCV infections in patients who received care at a single outpatient clinic in eastern Nebraska (September 2002)

- All regularly had cancer chemotherapy at one clinic

Of 613 clinic patients contacted, 494 (81%) underwent HCV testing.

99 clinic-acquired HCV infections were identified, who lacked previous evidence of HCV infection


Hepatitis C virus genotype 3a was present in all 95 genotyped samples and presumably originated from a patient with chronic hepatitis C who began treatment in March 2000.

Infection with HCV was statistically significantly associated with receipt of saline flushes (P < 0.001).

Shared saline bags were probably contaminated when syringes used to draw blood from venous catheters were reused to withdraw saline solution. The clinic corrected this procedure in July 2001.

was carried out in three risk groups: patients with burns, patients on chronic hemodialysis and the medical staff from six clinics.

## Seroprevalence of HCV infection

<table>
<thead>
<tr>
<th>Risk group</th>
<th>Patients n</th>
<th>HCV(+) n</th>
<th>Seroprevalence %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients on Hemodialysis</td>
<td>241</td>
<td>103</td>
<td>42.7</td>
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<tr>
<td>Patients with burns</td>
<td>86</td>
<td>33</td>
<td>38.34</td>
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## Clinical forms of viral Hepatitis C

<table>
<thead>
<tr>
<th>Risk group</th>
<th>Acute hepatitis C</th>
<th>Chronic hepatitis C</th>
<th>Asymptomatic Chronic hepatitis C</th>
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<tr>
<td>HCV (+)</td>
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<tr>
<td>Patients on Hemodialysis (n=73)</td>
<td>3 (4.1%)</td>
<td>28 (38.4%)</td>
<td>42 (57.5%)</td>
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<tr>
<td>Patients with burns (n=33)</td>
<td>6 (18.2%)</td>
<td>-</td>
<td>27 (81.8%)</td>
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1993-95 year: **Burn Disease Ward**

- 3 nurses were **anti HCV-positive**

2008 year: **Hemodialysis Ward**

- From the 31 member of medical staff
- 1 physician, 2 nurses, 1 ward maid
- **were anti HCV-positive**

HCV and Health Care Workers

CDC reports of 600,000 to 800,000 needlestick injuries occur in HCW each year.

- However, the prevalence of HCV in public safety workers is low at 1.3-2.2% and
- in one study in Scotland, the prevalence in HCW was 0.28%.
- Risk of HCV+ surgeon transmitting it a patient estimated at 1 in 1,750-16,000 procedures
The HCWs are well known as a high risk group of exposure to different infectious agents, primarily to blood-borne viruses (HVB, HVC, HIV).

A Multi-centre cross-sectional study was conducted through 2007-2008 year to evaluate HBV and HCV seroprevalence in this occupational risk group.

The survey comprised 324 serum samples of HCW from Acute care hospitals in the 4 country region.

The following level of HBV and HCV seroprevalence in HCW was established:

- HBsAg - 5%
- Anti-HBc - 20.7%
- Anti-HBs - 63.4%
- Anti-HCV - 0%
- The proportion of vaccine-protected HCW - 46.1%

Bulgaria belongs to the countries with low endemic rate of HCV infections in population: 0.01-1.5% (Iliev, B., 2001)

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<tr>
<td>Anti-HCV+</td>
<td>1.3%</td>
<td>1.8%</td>
<td>0%</td>
<td>&gt;0.05</td>
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</table>

The founded in this study low HCV rate in HCW (most nurses) is similar with the results of French and Schottish studies (Torburn, D. et al, 2001; Yazdanpanah, Y. et al, 1999)

The Exposure prevention is the primary strategy to prevent and reduce the risk of occupational bloodborne pathogen infections in HCW.

HCWs should be made aware of the medicolegal and clinical relevance of reporting an exposure, and have ready access to expert consultation to receive appropriate counselling, treatment and follow-up.

A Questionnaire study describes the occupational risk of acquiring the HBV and/or HCV infection in HCWs in Bulgarian hospitals.

Questionnaires were completed from 1429 HCWs from 29 hospitals (2008).

Information collected about: occupation, vaccination status, serologic markers, self assessment of occupational risk, importance of preventative measures etc.

Results:
- 76.4% of HCWs was vaccinated (completed -3 doses)
- Serological markers: HBsAg- 1.5%; anti-HBs -2.2%; anti-HCV-0.4%
- Self assessment of occupational risk-89.9%
- Positive answer
- Evaluation of preventative measures: 53.3% appointed vaccination of most important measure, followed by PPE
A prospective study was carried out on clinical course and outcome of six male urology patients. The patients has been hospitalised in Urorly ward and undergo intravenous therapy. Three weeks later: hospitalised. Acute hepatitis HCV- genotype 1b.

Infected patients were followed up for 30 months after diagnosis.

Outcome:
- Four patients recovered completely.
- One developed chronic HCV infection.
- One died (cirrhosis due to co-infection with hepatitis B virus).

The INDEX CASE was established:
- Inpatient in the same clinique; chronic hepatitis C infection; on the same ward; at the same time
- The most-likely mode of transmission: i.v. heparin flushes
- Administered with a common syringe

HCV Prevention

- Characterises HCW
- High viral load (HBV, HCV, HIV)
- A-symptomatic carrier
- Exposure Prone Procedure
  (distinguish from “invasive procedures”)
- Surgery, traumatology, dentistry, midwifery etc.
Exposure-prone procedures!

- Are those where there is a risk that injury to the worker may result in exposure of the patient’s open tissue to the blood of the worker.

- These procedures include those where the worker’s gloved hands may be in contact with sharp instruments, needle tips or sharp tissues (specules of bone or teeth) inside a patient’s open body cavity, wound or confined anatomical space where the hands or fingertips may not be completely visible at all times.
Primary prevention of new infections

- Preventing transmission from blood or blood components, organs, tissue and semen through a comprehensive local and national plan

- **Hepatitis C vaccine Investigational** E1E2/ MF59 vaccine (Novartis)
  - Correlates of protection are complex
  - Human studies in planning stage?
  - Future development?

Secondary prevention of transmission from infected persons to other persons

Infection control practices
- Safe injection practices
- Communication for behaviour change
- Reduce number of injections
- Provision of single-use injection equipment and infection control supplies
- Sharps waste management

Special groups
- Hemodialysis
- Prisoners
- IVDU

Tertiary prevention of the pathological consequences

- (peg)-interferon + ribavirin
  - Well established > 40-80% virus elimination
  - Cheaper drugs are partially available

- New antivirals in development
  - Treatment is expensive and monitoring is demanding

Who should be treated?
- Treatment may not change the public health problem

General policies

- Exposure prevention is the primary strategy to reduce the risk of occupational bloodborne pathogen infections.
- All preventive efforts should be made to reduce the risk of occupational exposures.
- Based on two documents: Recommendations to protect medical staff from infection with HIV, HBV, HCV in medical and health institutions. Ministry of Health Order RD 09-693, 25.08.2004
- Recommendations post-exposure prophylaxis indication of the medical staff for hepatitis B, C and HIV infection. Ministry of Health Order RD 09-694, 25.08.2004
- HCFs have a protocols for the reporting, evaluation, post-exposure prophylaxis, treatment, and follow-up HCWs at risk of acquiring a bloodborne infection in case of occupational exposures.
Education and training of HCWs-Bulgarian experience

- National HAI Reference Centre, NCI PD organized annually Training courses for Nurses and Physicians, both based in NCI PD and different hospitals through the country (1)

Object: HAI prevention and control with special topics on blood-borne pathogens exposure prevention and post-exposure measures:

- The possible risks of bloodborne infections after an occupational exposure
- The preventative measures for bloodborne pathogen exposures
- Standard precautions and personal protective equipment
- Safety culture, safety devices and safer procedures.
- HBV vaccination
Education and training of HCWs - Bulgarian experience - 2

- Based on Regulatory documents: presentation of principles of post-exposure measures and the importance of early reporting and start post exposure prophylaxis or treatment to maximise their effectiveness.

- National HAI Reference Centre, NCI PD provides also the training for ICNurse and ICDocotor with Diploma. (2) In the officially improved Program by the Ministry of Health are imbedded these so important topics mentioned above.

- Joint Training seminars organised from BulNoso and National HAI Reference Centre, NCI PD based on different hospitals.
Training courses: Focus on HAI prevention and control with special topics on blood-borne pathogens exposure prevention and post-exposure measures organized by National Centre for Infectious and Parasitic Diseases, National HAI Reference Centre, Sofia, Bulgaria and Join with BulNoso Association.
Overview of the current regulatory documents for prevention and control measures

- CDC Isolation Guideline
- CDC Hand Hygiene Guideline
- Guidelines for the management of occupational exposures to HBV, HCV, HIV and recommendations for postexposure prophylaxis.

- MMWR, 2001, 50, (RR11) 1:42

- General Policies:
- Exposure prevention
- Educational programmes and training about:
  - possible risk
  - measures to prevent exposure
  - implementation of standard precausions
  - provision of PPE and safety devices
  - implementation of safer procedure
  - no vaccine for HCV
  - postexposure management

- VHPB meeting outlined a number of recommendations for the prevention and control of viral hepatitis in the following domains:
  - application of standard precautions,
  - panels for counselling infected healthcare workers and patients,
  - hepatitis B vaccination,
  - restrictions on the practice of exposure-prone procedures by infected healthcare workers,
  - ethical and legal issues,
  - assessment of risk and costs,
  - priority setting by individual countries
  - and the role of the VHPB.
Bulgarian regulations Documents

- **Decree N2 from 10 January, 2005** on the Organization of Prevention and Control of Nosocomial Infections. Issued by the Ministry of health, SG N8, 1 Jan., 2005

- **Ordinance N13 of August 7, 1998** on the organization of prevention and control of nosocomial infections (Repealed SG N8, 2005)

Bulgarian regulations
Documents

- Recommendations to protect medical staff from infection with HIV, HBV, HCV in medical and health institutions. Ministry of Health Order RD 09-693, 25.08.2004

- Recommendations post-exposure prophylaxis indication of the medical staff for hepatitis B, C and HIV infection. Ministry of Health Order RD 09-694, 25.08.2004
- **Health Law** - SG (State Gazette) N 70 of 10.08.2004, effective from 1.01.2005:

- The Health law *regulates activities and ensure quality control of health care.* In Bulgarian legislation this Act regulates the rights and obligations of the patients in accordance with the Convention on the Protection of Human Rights and Human Dignity in the application of biology and medicine (Convention on Human Rights and Biomedicine) Council of Europe, signed on May 31, 2001.


- **Medical Devices Law.** SG N 46 12 June, 2007; SG N 110 30 December, 2008; am. SG N 41,2 June 2009., am. SG N 82 16 October 2009.

- **Law on Waste Management** (SG N.86/ 30.09.2003)
Future

- Determine **ways to reduce new HBV and HCV infections, morbidity and mortality**, related to chronic viral hepatitis
- **Assess current prevention and control activities**
- **Identify priorities** for research, policy and action
Future

- **Develop Screening specific recommendations**
- Population at risk of acquiring HCV and HBV are known, **BUT**
- Aren’t necessarily being screened systematically and effectively
- Most chronically infected individuals are unaware of their status

The European Social partners in the hospital and healthcare sector, HOSPEEM (European Hospital and Healthcare Employers' Association) and EPSU (European Public Services Union) signed a Europe-wide framework agreement (the Agreement) on the prevention of sharps injuries on 17 July 2009, which has been incorporated into the proposal for a Council Directive (the Directive) – COM (2009) 577 final (26 October 2009) which was adopted by the Council of Ministers on 8 March 2010.
The Agreement and the Directive recognise that the everyday work of healthcare staff puts them at risk of serious infections, with more than 30 potentially dangerous pathogens, including hepatitis B, hepatitis C and HIV, as a result of needlestick injuries.
The agreement aims to:

- **achieve the safest possible working environment** for employees in the sector and protect workers at risk;
- **prevent injuries to workers caused by all types of sharp medical objects (including needle sticks);**
- **set up an integrated approach to assessing and preventing risks as well as to training and informing workers.**
the responsibility of each worker to take care of his or her own safety and the duty of the employer to ensure the health and safety of workers in every aspect relating to their work;

- to never assume that no risks exist;
- promoting a ‘no blame’ culture. Incident reporting should focus on systemic factors rather than individual mistakes and systematic reporting must be considered as accepted procedure.
- **Risk assessment procedures** shall be conducted in compliance with articles 3 and 6 of Directive 2000/54/EC and Articles 6 and 9 of Directive 89/391/EEC.

- **Elimination, prevention and protection**
  Where the results of the risk assessment reveal a risk of exposure, this must be controlled, by:

- **Elimination - eliminating the unnecessary use of sharps** by implementing changes in practice and on the basis of the results of the risk assessment.
- **Safe Procedures** - specifying and implementing safe procedures for using and disposing of sharp medical instruments and contaminated waste. **The practice of recapping shall be banned with immediate effect.**

- **Engineering Controls** - providing medical devices incorporating safety-engineered protection mechanisms;

- **PPE** - the use of Personal Protective Equipment (gloves, masks, gowns, etc).
When considering **these devices** the following **selection criteria** should be applied:

- The device must **not** compromise patient care;
- The safety mechanism **must be an integral part of the safety device**, not a separate accessory;
- The device must **be easy to use**;
- The **activation of the safety mechanism must be convenient** and allow the care-giver to maintain appropriate control over the procedure;
- The **device must not create other safety hazards** or sources of blood exposure;
- A **single-handed or automatic activation is preferable**;
- The activation of the safety mechanism must manifest itself by means of an **audible, tactile or visual sign** to the health professional;
- The safety **mechanisms should not be easily reversible** once activated.
- **Information and awareness-raising**
- **Training**: The correct use of medical devices incorporating sharps protection mechanisms;
- Induction for all new and temporary staff;
- The risk associated with blood and body fluid exposures;
- Preventative measures including standard precautions, safe systems of work (including the ban on recapping/resheathing) and, the correct use of sharps bins and disposal procedures;
- **The importance of immunisation** and how to access immunisation services;
- **The reporting, response and monitoring procedures and their importance**;
- Measures to be taken in case of injuries.
Reporting, response and follow-up

- Under the Directive **workers must immediately report any incident involving sharps** to the employer and/or person in charge, and/or or to the person responsible for safety and health at work.
Where an injury involving a sharp occurs the employer shall:

- Take the **immediate steps for the care of the injured worker**, including the provision of post-exposure prophylaxis and the necessary medical tests;
- Provide appropriate **health surveillance**;
- **Investigate the causes** and circumstances of the incident;
- Ensure **systems are in place to record the incident**; and
- Provide **counselling support for the injured worker**.
Monitor and Review

- The employer **must ensure that systems are in place to monitor** the effectiveness of local policies and procedures,

  - e.g. by **providing regular reports on numbers and analysis of sharps injuries** to the appropriate health and safety committees.

- Following the results of monitoring, policies, procedures and **training should be regularly reviewed in consultation with workers and their representatives.**
Council Recommendation on patient safety, including the prevention and control of healthcare associated infections

2947th EMPLOYMENT, SOCIAL POLICY, HEALTH AND CONSUMER AFFAIRS Council meeting

Luxembourg, 9 June 2009

"THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty establishing the European Community, and in particular the second subparagraph of Article 152(4) thereof,

Having regard to the proposal from the Commission,
Patient Safety as a priority issue in health policies

- Development of safe systems, processes and tools
- Regular update of safety standards/best practices
- Self practices to prevent adverse events

Katja Neubauer
Health Strategy and Health Systems Unit
Brussels, 2 December 2009