Estimation of the Number of Individuals Infected as a Consequence of Blood Transfusion in Scotland 1970 – 1991.

1. Introduction

The following is Health Protection Scotland's response to a request from the Penrose Inquiry. The work, undertaken by HPS (Professor David Goldberg and Dr Christian Schnier), was informed by advice from Drs Jack Gillon and Brian McClelland who are contributing to the Penrose Inquiry in an SNBTS capacity.

2. Aim

The aim of the exercise was to estimate the number of people who acquired HCV as a consequence of blood transfusion in Scotland during 1970 – 1991.

3. Background

In the context of the period of investigation (i.e. 1970 – 1991), two measures to reduce the probability of a blood transfusion recipient becoming infected with HCV were introduced:

- The deferral of potential blood donors, at higher risk of blood borne virus infection, was implemented in 1984.
- HCV antibody testing of blood donors was implemented in September 1991; those positive were excluded from the blood donation process.

4 Method

4.1 Design

Because HCV infection, in over 95% of instances, is a silent event, with the consequences of long standing infection only becoming apparent decades after its acquisition, it is only possible to estimate the numbers of individuals who acquired their infection through blood transfusion (or indeed any other route). A statistical modelling approach using observed data and assumptions (based on observations and expert opinion) was employed. Information regarding the observed data and the assumptions is presented below. The detail relating to the model and the modelling process is not provided in this paper but can be sourced from HPS if required.

4.2 Available Observed Data

- Number of blood donations made by blood donors for each year during 1975 – 1991.
- The prevalence of HCV antibody among individuals donating their blood during September – December 1991.

4.3 Assumptions

- The number of blood donations made by blood donors during 1970 – 1974.
- The average number of blood components generated by a blood donation.
- The probability of a blood component being transfused.

- The probability of a transfused blood component being infected with HCV.

4.3.1 The Probability of a Transfused Blood Component being infected by HCV

This probability is influenced by two key factors – i) the size of Scotland's hepatitis C infected population in any particular year, and – ii) the effectiveness of SNBTS's deferral policy during 1984 – 1991.

4.3.1.1 The Size of Scotland's Hepatitis C Infected Population in any Particular Year

- Estimates of the size of Scotland's hepatitis C infected population for each year going back to 1970 do not exist. However, estimates of the number of HCV infected injecting drug users in Scotland alive in each year going back to the 1960s do exist; these relate to a paper published in the world's foremost liver disease journal – Hepatology – in 2005.

- The contribution that injecting drug use has made, and continues to make, to Scotland's HCV infection problem is very considerable; it is estimated that 90% of diagnosed HCV infection cases in Scotland are individuals who have ever injected drugs. Further, the estimated numbers of HCV infected injecting drug users have risen twenty fold from 600 alive in 1970 to 19100 alive in 1991.

- Injecting drug use is, and has been, the principal driver of Scotland's HCV epidemic both directly and indirectly. From a blood transfusion perspective, an infected injecting drug user donating blood would constitute a direct effect; an indirect effect would apply if a blood donation stemmed from a donor, who had never injected drugs but who had acquired HCV sexually from an injecting drug user or via a needle/instrument (in a healthcare/tattoo/barber setting), contaminated with blood from an HCV infected injecting drug user.

- Accordingly, it was considered prudent to build into the statistical model a factor accounting for the changes in the size of Scotland's HCV infected injecting drug user population during 1970 – 1991.

4.3.1.2 The Effectiveness of SNBTS's Deferral Policy during 1984 – 1991

- Following the implementation of the deferral policy in 1984, many individuals at high risk of HCV infection (e.g. people who have ever injected drugs) were excluded from donating blood; accordingly, there is no question that the deferral policy, applicable to period 1984 – 1991, had an impact in reducing the probability of a blood transfusion recipient becoming infected with HCV. Because the impact was considered by experts to be an appreciable one it was considered essential to build into the statistical model a factor accounting for it; the factor was based on limited observed data and expert opinion.

5. Results

- The following are upper, mid and lower estimates of the numbers of individuals who acquired HCV infection as a consequence of blood transfusion in Scotland during 1970 – 1991; the upper and lower estimates reflect uncertainty surrounding the factors introduced into the model.

- Note that approximately one quarter of infected individuals alive six months after their blood transfusion will have spontaneously cleared their infection; the remaining will have developed chronic infection.

- Also note that for 1991, only the period prior to the introduction of testing is included – i.e. January to August.

Estimates of numbers infected with HCV

Year	Lower	Mid	Upper
1970	8	11	14
1971	9	13	17
1972	10	14	19
1973	12	16	22
1974	13	18	24
1975	14	19	26
1976	16	22	30
1977	22	30	41
1978	29	39	53
1979	37	51	69
1980	46	63	85
1981	60	82	111
1982	81	111	149
1983	108	148	199
1984	53	66	82
1985	67	83	104
1986	82	102	128
1987	85	106	132
1988	100	125	156
1989	113	141	177
1990	124	155	194
1991	94	117	146
Total Infected	**1183**	**1532**	**1978**

6. Conclusion

- The relatively small number of infections acquired through blood transfusion in Scotland during the 1970s reflects the fact that injecting drug use, and thus transmission of HCV among injecting drug users, was relatively uncommon during that decade.

- During the late 1970s and early 1980s the numbers of injecting drug users increased dramatically as a consequence of unemployment among young people and the involvement of Scotland in drug routes stemming from the Far East. Injection equipment sharing was the norm as a consequence of i) lack of knowledge about the risks of transmitting blood borne viruses through this behaviour and ii) lack of availability of sterile injection equipment. By the mid to late 1980s, when these two factors were beginning to be addressed, HCV infection was rife among injecting drug users throughout the country; prevalence rates exceeding 80% were observed among injecting drug users in central Scotland.

- The sharp decline in the estimated numbers of infected blood transfusion recipients in 1984 reflects the impact of SNBTS's deferral policy but this impact was offset during the mid to late 1980s by increasing numbers of HCV infected injecting drug users in the country due to a combination of an increase in the number of people injecting drugs and the limited implementation of harm reduction measures – principally needle and syringe exchange and opiate substitution therapy – to prevent the transmission of Bloodborne Viruses among this population.

- Nevertheless, it is evident from the estimates, as above, that the two key measures implemented by SNBTS to reduce the probability of blood transfusion recipients becoming infected with HCV prevented thousands of blood transfusion recipients becoming infected.

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05/10/2011
Dated

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03.10.2011
Dated