Cost Utility Analysis Subgroup

Brian Custer ISBT WP-TTID Cancun, Mexico July 8, 2012 Global risk assessment and cost utility of blood safety interventions – development of a webbased application and multi-country analysis framework

Subgroup meeting July 7, 2012

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- Reviewed the website
- Discussed the remaining tasks and problems
- Reviewed available use statistics
- Discussed new ideas

Web-Interface

http://bloodsafety.isbtweb.org/cua

- Development of the web-interface was sponsored by the ISBT TTID working party.
- Goal: make Cost-Utility analyses of blood screening interventions available to a wide audience without requiring expertise on model development and/or health economics.
- Blood screening strategies consist of:
 - 1) antibody assays (Abs) for HIV and HCV + HBV surface antigen (HBsAg),
 - 2) antibody assays that include antigens for the agents of interest (Combo tests),
 - 3) NAT in minipools of 6 donations (MP NAT), and
 - 4) individual donation (ID) NAT can be compared

Web interface

http://bloodsafety.isbtweb.org/cua

- Country-specific data on the prevalence (and incidence where available) of each infection, percentage of first time and regular donors, cost of different testing methods, average age of transfusion recipients, transfusion survival and related parameters were used
- Results provided from the web-interface include the number infections interdicted using different ID screens, and as incremental cost per disability adjusted life year averted (\$/DALY)
- The suggested UN/WHO threshold of three times the gross national income (GNI) per capita can be used to define which testing strategies can be classified as cost-effective
- Tool currently also accessible at:

https://interactive.basecase.com/anon.py?isbt-cua

Introduction page

BLOODSAFETY About References Terms		
Introduction Step 1 Step 2 Step 3 Step 4 Step 5 Step 6 Step 7 Step 8 Results		
Welcome	Predefined Country	Scenarios
This tool allows you to perform customized analysis of blood donation screening strategies for the following test	Scenarios	Save
combinations:	USA	×
HIV Ab + HCV Ab + HBsAg	Ghana	
HIV Combo + HCV Combo + HBsAg	The Netherlands	
All Mini Pool Multiplex NAT All Individual Donation Multiplex NAT	Brazil	
Do nothing (HIV, HCV, HBV)	South Africa	
You can update the model parameters with your own data, and estimate the cost-effectiveness of screening in your setting. It may be useful to look over the tabs for the kind of information that you will need to obtain, before you start entering data.	Thailand	
The steps in the process are:		
Select a country from the list to the right that matches your setting best. The default values for that country will appear. These values can be changed with your data. At any point in time, if you want to go back to the default values, you can re-select the country in the introduction tab.		
 If you can't provide data for a particular strategy, you can leave the default value. Click on tabs 1-8 to enter your data. On the last tab (Results), you can select the strategies you are interested in. 	Advanced	

Steps

- 1. Risk model and donor population
- 2. Recipient/patient epidemiology
- 3. Infectious window periods
- 4. Donor screening costs
- 5. Methodology (health economic factors)
- 6. HIV+ disease progression and treatment costs
- 7. HBV+ and HCV+ disease progression
- 8. HBV and HCV treatment costs

Results

Results options

- 1. Infections remaining, costs and DALYs
- 2. Incremental cost effectiveness ratios (ICERs)
- 3. Cost-effectiveness plane

Download report

Results Infections, Costs and DALYs

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Select Strategies	Results The results are presented in	the 3 tabs b	elow.			
Please select the screening strategies you	Infections remaining, Costs and DAI	Ys ICER	s Cost-E	Effectiven	ess Plane	
would like to compare for your setting. Results can be viewed in three different	Screening Strategies	HIV	HCV	HBV	Costs	DALYS
ways by selecting the tab for ICERs, Cost-Effectiveness Plane, or Totals shown	HIV Ab + HCV Ab + HBsAg	0.96	7.11	8.64	\$11,989,826	11
at right.		#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
HIV Ab + HCV Ab + HBsAg	All Mini Pool (x) Multiplex NAT	0.41	0.77	5.59	\$32,400,246	4
HIV Combo + HCV Combo + HBsAg	All Individual Donation Multiplex NAT	0.26	0.60	4.64	\$41,930,209	3
✓ All Mini Pool (x) Multiplex NAT	Do nothing (HIV, HCV, HBV)	41.08	477.36	246.38	\$3,718,395	493
 All Individual Donation Multiplex NAT Do nothing (HIV, HCV, HBV) 	DALYs- Disability Adjusted Life Years					
Save your data Save your data by clicking on the Save button below. After you have given your scenario a name, you can compare it to the predefined default scenarios.	The sum of years of potential life lost lost due to disability.More information of			ality and th	e years of pro	ductive life

Scenarios	Save
USA	^
Ghana	-

Results for six countries

Country	Abs+ HBsAg*	Combo+ HBsAg*	Minipool NAT*	Individual Donation NAT*	UN/WHO Threshold (3xNGI)
Brazil	Dominant	Dominant	299,300	1,254,000	22,050
Ghana	Dominant	608	1,762	4,896	2,010
South Africa	Dominant	Dominant	Not Applicable	174,700	17,334
Thailand	Dominant	5,291	15,840	52,191	8,520
The Netherlands	Dominant	4,833,442	6,600,446	93,453,997	150,450
USA	17,100	Not Applicable	2,934,000	24,729,000	144,669
*Anti-HIV, Anti-HCV, and HBsAg are compared to no intervention and then each intervention set is compared incrementally to the intervention set to the left. Combo means combined antibody and antigen assays. Not applicable means the testing strategy is not available in the country.					

Website use in the last year

- No formal registrations for the tool all the logins to the tool were anonymous
- Users only have to register if they want to save their data (create a new scenario that gets saved to the server)
 - People could have downloaded the report, but we cannot track this
 - Of the total 92 accesses, all ran one or more simulations, by entering new data or adjusting values in 6 countries.

Current issues

Web site unavailable for a few months due to a web address change at ISBT

http://bloodsafety.isbt-web.org/cua

http://bloodsafety.isbtweb.org/cua

Tracing model and web interface problem

- We are still struggling with a bug that was reported by Bio-Rad
- Aberrant results when using the tool
- Is this a result of the underlying model or a web interface

Completion of manuscript

- Focus on 6 countries
 - Attempts to include other countries were not successful
 - Face validity to be established by comparing results to published studies for the Netherlands and the USA
 - Primary route for increasing knowledge and use of the tool

Updates on project

Primary problem is outreach to facilitate use of the tool

- Need to work with TTID members to facilitate wider use
- Need to find ways to present/promote to wider audiences
- Submission of manuscript will be key to the enhancing knowledge of the project

New ideas

How complex does a CUA analysis have to be?

Is the current tool too complex

- Simplified model
 - Can the core parameters necessary for an 'order of magnitude' assessment of cost-utility be developed?

New ideas

International Forum

Topic: Use of health economics and cost-utility studies in blood safety decision making

• Different stakeholders will have different positions

• Goal: Understand the breadth of opinions

Acknowledgements

- ISBT TTID working party
- CUA workgroup (Brian Custer, Mart Janssen, Gijs Hubben, Rene van Hulst)
- A large group of people who provided the data for the 6 countries included in the tool (USA, Netherlands, Brazil, Ghana, Thailand, South Africa)

Questions and comments?

Steps in the Analysis

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Step 1 - Risk model and donor population

First, you will need to enter the prevalence data for your setting. Second, you select the modeling approach you will use. This decision should be based on the data that you have available. There are three choices: 1) Yield model, 2) Prevalence model, and 3) Incidence model. The Yield model uses the observed yield of testing and is most appropriate when you have information on the yield of specific tests, but do not have information on blood donors. The Prevalence model is the simplest to use and does not require any further data. The Incidence model will provide the most accurate measure of residual risk and therefore better estimation of the cost-effectiveness in your setting but requires that you have information on both testing results and blood donors in your setting.

Enter the prevalence data for your setting:	Incidence Model Yield Model	
Prevalence Donors HIV Ab+ 0.00334 %	Incidence Data Input	
Prevalence Donors HCV Ab+ 0.03948 %	Regular Donors	80.8 %
Prevalence Donors HBsAg+ 0.04 %	Incidence Regular Donors HIV Ab+ (Per Million DY)	17
Select Model Option : Incidence Model	Incidence Regular Donors HCV Ab+ (Per Million DY)	44.3
	Incidence Regular Donors HBsAg+ (Per Million DY)	28.3
Note: If you have selected Incidence or Yield	Prevalence First Time Donors HIV Ab+	0.0106
model, please select the tab to the right and fill	Prevalence First Time Donors HCV Ab+	0.1512
out the fields. If you are using the Prevalence model, these fields are ignored.	Prevalence First Time Donors HBsAg+	4.659
nicuo, alco nolas ale ignorea.	Correction Factor for HBsAg+ Incidence	3

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Step 3 - Infectious Window Periods

If you are interested in Minipool NAT for your setting, please specify a pool size on the right side of the table below. Optionally, you may also adjust the window periods of the tests. However, unless you have specific data on the windows periods of the tests available in your setting, it is better to use the pre-loaded data.

HIV Ab	20.3 Days
HBsAg	38.3 Days
HBsAg (late stage)	24 Days
HCV Ab	58.3 Days
HIV Combo (Ab,p24)	15 Days
HCV Combo (Ab,Ag)	12.5 Days
HIV ID-NAT, Ab	5.6 Days
HBV ID-NAT, HBsAg	20.6 Days
HBV ID-NAT, HBsAg (late stage)	12.9 Days
HCV ID-NAT, Ab	4.9 Days

Multiplex Minipool NAT

For the pool size you select the window periods will automatically be estimated.

Pool Size	6
HIV MPNAT, Ab	8.74 Days
HBV MPNAT, HBsAg	26.19 Days
HCV MPNAT	6.35 Days
HBV MPNAT, HBsAg (late stage)	11.87 Days

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Step 6 - HIV+ Recipient

Data on HIV disease progression and costs of treatment in your setting or a similar one are necessary. Please complete as much of the table below as you can. If you do not have the requested information please leave the pre-loaded values. For more data and statistics, please see the <u>WHO</u> site.

Basic Reproduction Ratio of HIV	0
Availability of Antiretroviral Therapy to HIV Infected Recipients	95 %
Recipients Infected with HIV before Transfusion	0.5 %
Duration of WHO Stages 1 and 2	5 years
Extension of WHO Stage 3 by Antiretroviral Therapy	12
Cost of Basic Care for HIV	\$/year 5408
Cost of Basic Care for AIDS	\$/year 11534
Cost of Antiretroviral Therapy	\$/year 5447

Results

Incremental Cost Effectiveness Ratios

BLOODSAFETY About	Refere	nces				
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Select Strategies	Results	The results are preser	nted in the 3 tabs	below.		
Please select the screening strategies you		ions remaining, Costs ar	nd DALYs ICE	Rs Cost-Effe	ctiveness Pla	ine
would like to compare for your setting.						
Results can be viewed in three different		Ab+HBsAg	Combo+HBsAg	MP Multi NAT	ID Multi NAT	Compared to:
ways by selecting the tab for ICERs, Cost-Effectiveness Plane, or Totals shown		17,141	NA	58,592	77,999	Do Nothing
at right.			NA	2,934,025	4,078,056	Ab+HBsAg
				NA	NA	Combo+HBsAg
HIV Ab + HCV Ab + HBsAg					24,729,432	MP Multi NAT
HIV Combo + HCV Combo + HBsAg						

This table shows the incremental cost effectiveness ratios in US\$ per DALY averted.

- Each screening strategy on the first row is compared to the strategies in the last column.
- NA (Not applicable) will appear for strategies you have not selected.
- A screening strategy is said to be Dominated if it is more costly and less effective than the comparator.
- A screening strategy is said to be Dominant if it less costly and more effective than the comparator.

- All Mini Pool (x) Multiplex NAT
- ✓ All Individual Donation Multiplex NAT
- ✓ Do nothing (HIV, HCV, HBV)

Save your data

Save your data by clicking on the Save button below. After you have given your scenario a name, you can compare it to the predefined default scenarios.

Scenarios	Save
USA	*
Ghana	
	T

Results

Cost Effectiveness Plane

BLOODSAFETY About References Terms				
Introduction Step 1 Step 2 Step 3 Step 4 Step 5 Step 6 Step 7 Step 8 Results				
Select Strategies	Results The results are presented in the 3 tabs below.			
Please select the screening strategies you would like to compare for your setting. Results can be viewed in three different ways by selecting the tab for ICERs, Cost-Effectiveness Plane, or Totals shown at right.	Infections remaining, Costs and DALYs ICERs Cost-Effectiveness Plane 600,000 CE-Plane			
 HIV Ab + HCV Ab + HBsAg HIV Combo + HCV Combo + HBsAg All Mini Pool (x) Multiplex NAT All Individual Donation Multiplex NAT Do nothing (HIV, HCV, HBV) 	II Individual Donation Multiplex NAT 400,000 All Mini Pool (x) Multiplex NAT			
Save your data Save your data by clicking on the Save button below. After you have given your scenario a name, you can compare it to the predefined default scenarios.	200,000 HIV Ab + HCV Ab + HBsAg			
Scenarios Save	0 +			
USA Ghana	DALYS			

USA data on previous analyses

Intervention (Comparator)	Cost per QALY	Year of Publication
HCV Ab (no screen)	Cost saving	1997
HIV Ab (no screen)	3,600	1988
Mechanical barrier to prevent ABO-mismatch (none)	197,000	1996
WNV NAT (no screen)	520,000 - 897,000	2005
T cruzi Ab (no screen)	757,000 - 1,360,000	2010
PRT platelet concentrates (current screens)	458,000 - 1,816,000	2003
PRT platelets and plasma (current screens)	1,423,000	2010
Minipool HIV/HCV/HBV NAT (serology)	1,500,000	2004
Individual Donation HIV/HCV/HBV NAT (serology)	7,300,000	2004
Bacterial culture of platelets	Not available	
HTLV	Not available	
Syphilis	Not available	
TRALI risk reduction	Not available	

Conclusions

- The web-interface provides an easy to use tool for conducting cost-effectiveness analyses in blood screening.
- Countries where the largest numbers of infections are interdicted through testing tend to have the most favorable cost-utility results.
- As expected, the cost of testing and incremental health effects have a dramatic influence on cost-utility results. The value of the addition of NAT to serological testing is highly dependent on the country-specific prevalence and incidence of viral infections in blood donors.
- The cost-utility of blood safety interventions in some countries does not meet the threshold developed by UN/WHO.