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Evaluation of the WHO global database on blood safety

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Abstract

Objective—While the Global Database on Blood Safety (GDBS) helps to monitor the status of adequate and safe blood availability, its presence alone does not serve as a solution to existing challenges. The objective of this evaluation was to determine the GDBS usefulness in improving the availability of adequate safe blood and its ability to function as a surveillance system.

Methods—The GDBS was evaluated using methods set out by the Centers for Disease Control and Prevention (CDC) Guidelines for assessing surveillance systems. Six recommended tasks were used to evaluate if the GDBS met the requirements of a surveillance system in a public health context.

Results—The majority of stakeholders engaged with GDBS found it was unique and useful. The GDBS answered all six questions essential for determining a blood safety surveillance system's usefulness. The GDBS fully met the needs to six of the eleven attributes used for evaluating the usefulness of a surveillance system.

Conclusion—The GDBS is a unique global activity that provides vital data on safety of blood transfusion services across countries and regions. However, aspects of the GDBS such as timeliness of reporting and improvement of WHO Member States national blood information systems could enhance its effectiveness and potential to serve as a global surveillance system for blood safety.

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Author contribution

UK led the design of the study, guided the data collection and creation of tables and figures, and drafted the manuscript. DS, MC, MQ and BK provided critical guidance on the project to make it as relevant as possible and contributed to the drafting of manuscript. RS contributed to review data, table and figure creation, and analysis of the data for the manuscript. NB and IB participated in the drafting of the manuscript. FM supervised the data collection and drafting of the manuscript. The corresponding author attests that all listed authors meet the criteria for authorship and that no others meeting the criteria have been omitted. All authors have read and approved the final draft. UK is the guarantor.

Authors' note

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Conflicts of interest

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Data sharing

No additional data are available.

Keywords

blood safety; WHO; transfusions; surveillance

Introduction

The right to an adequate and safe blood supply is one that the World Health Organization (WHO) has championed for over a decade [1]. However, in many low-resource countries, the morbidity and mortality associated with an inadequate supply of safe blood products remains high and has a direct impact on individuals and their families [2]. Blood transfusion is an essential component of health care which saves millions of lives each year. Every second, someone across the world needs blood for surgery, trauma, severe anemia or complications of pregancy [3,5,6]. An investment in a safe and adequate blood supply is therefore not only a responsibility of governments, but also a cost-effective investment in the health and economic wealth of every nation [4, 5].

The Global Collaboration for Blood Safety (GCBS) was a WHO-convened forum, established in 1995 in response to the Paris AIDS Declaration to fight HIV/AIDS [4]. The GDBS had the mission to promote the harmonization of all efforts to improve global blood safety and avoid duplication of activities [7].

The WHO Global Database on Blood Safety (GDBS) was established in 1998 and in 2001, the WHO Global Database on Blood Safety (GDBS) published its first report on blood safety in WHO Member States. Over the years, the GDBS has evolved from paper-based forms to electronic forms. Despite many initiatives and interventions, blood safety remains an important public health concern in Africa and other parts of the world where lack of availability of blood or provision of unsafe blood impacts morbidity and mortality [6]. One measure of a successful public health programme is the production, analysis, dissemination and use of reliable and timely information on health determinants and health status; however, the GDBS has struggled with the timely dissemination of information [7, 8].

Despite the GDBSs' operating for over a decade, it has never been formally evaluated for its impact on improving blood safety and public health globally. The aim of this paper is to evaluate the GDBS using the Centers for Disease Control and Prevention (CDC) Updated Guidelines for Evaluating Public Health Surveillance Systems (hereafter, Guidelines) as a framework to assess if the GDBS has the potential to function as a public health surveillance system [9].

Methods

We used the CDC Guidelines as a framework to evaluate the usefulness of the GDBS as a global health tool and its ability to serve as a potential surveillance system. According to the CDC Guidelines, a surveillance system is defined as 'the ongoing systematic collection, analysis and interpretation of health data essential to the planning, implementation and evaluation of public health practice, closely integrated with the timely dissemination of this

information to those who need to know' [9]. The CDC guidelines recommend the use of six required tasks in the performance of surveillance evaluations [9]:

- Task A. Engage the Stakeholders in the Evaluation
- Task B. Describe the system to be evaluated
- Task C. Focus the Evaluation Design
- Task D. Gather Credible Evidence Regarding the Performance of the System
- Task E. Justify and State Conclusions, Make Recommendations
- Task F. Ensure Use of Evaluation Findings and Share Lessons Learned

Literature review

We conducted a literature review of the English-language peer reviewed academic research and grey literature (that is published reports by WHO). The internet and PUBMed was searched for reports published from 1995–2017 containing the words: Global Data Base on Blood Safety and Blood Safety Database. A review of existing literature did not reveal any similar or comparable global blood safety database or other comprehensive blood safety data sources or tools available for monitoring the availability of adequate and safe blood around the world.

Patient and public involvement

This research was done without patient involvement. Patients were not invited to comment on the study design and were not consulted to develop patient relevant outcomes or interpret the results. Patients were not invited to contribute to the writing or editing of this document for readability or accuracy.

Results

Public health information system evaluation

Since its establishment, the GDBS has collected vital data from WHO Member States, used to guide recommendations and strategies to improve global blood safety.

Task A. Engage the stakeholders in the evaluation—We engaged the GDBS technical advisor and the expert committee that oversees the GDBS status reports when conducting this evaluation. The expert committee consisted of representation from the six WHO regions. An informal interview of the expert committee was conducted with open ended questions. Due to time constraints, it was not possible to engage all member states for the evaluation. However, we were able to engage with a single member state during the course of the evaluation. The conclusions drawn from the stakeholder interviews were used primarily as anecdotal evidence.

Task B. Describe the system to be evaluated—The GDBS was designed to collect key data that facilitate to monitoring of blood transfusion services in all Member States of the WHO with the following objective: To collect and analyze data from all countries on

blood and blood product safety as the basis for effective action to improve blood transfusion services globally. The GDBS yearly sends a standardized questionnaire consisting of 7 sections and 100 indicators to all health authorities in WHO Member States. In 2002, the questionnaire was revised and in 2005, the questionnaire was translated and issued in six languages (i.e., Arabic, Chinese, English, French, Russian and Spanish).

A programme logic model (Fig. 1) was developed by the authors to explain the system's objectives, resources, activities, outputs and outcomes. Blood donors and blood donation information is collected at the level of the blood banks; data are aggregated at the level of the National Blood Transfusion Service (NBTS) or by an organization or entity that is responsible for national blood safety programs, and submitted to the national health authorities who report the information to GDBS. In some cases, the data maybe aggregated at the level of the national health authority and then reported to GDBS. A group of international experts from the transfusion medicine community analyses that data, and WHO generates and disseminates the report and findings to WHO Member States (Table. 1). The total cost of personnel and blood information systems per NBTS is dependent upon multiple factors such as size of country, population, existing systems and Gross Domestic Product. WHO and CDC currently fund the GDBS. However, at the Member State level funding for the NBTS is primarily from MOH and other donor sources.

Task C. Focus the evaluation design—The intent of the evaluation was to understand if the GDBS, which was established to provide data on blood transfusion services in all WHO Member States, met this need and if its purpose could be expanded to that of surveillance system. CDC Guidelines suggest that meeting the following attributes: simplicity, flexibility, data quality, acceptability, sensitivity, positive predictive value, representativeness, timeliness and stability, are good indicators that a surveillance system will be more useful and complete for public health action [9]. However, due to the scope of the GDBS, and need to focus on characteristics that are essential for a useful surveillance system, six attributes were prioritized. The system attributes prioritized for this GDBS evaluation were usefulness, representativeness, simplicity, flexibility, stability and acceptability. We then proceeded to evaluate each attribute prioritized based upon how they provided evidence supporting the activity objectives (Table 1), which included collecting and analysing data from all countries, assessing global blood safety, best available information and monitoring trends in blood safety. The overall performance of each attribute was evaluated, using a rating system of; fully meets the needs, partially meets the needs, does not meet the needs, and not applicable.

Task D. Gather credible evidence regarding surveillance system performance —A surveillance system is considered useful if it answers at least one of six questions (Table 2) [9, 10]. The GDBS exceeds the criterion set by the CDC Guidelines for usefulness as demonstrated in that it answers all six questions [9]. The GDBS was designed to collect and analyze data on national blood systems from all countries as the basis for effective action to improve access to safe blood and blood products and transfusions globally2. We reviewed all GDBS reports from 1998 to 2016, for criteria that answered or was related to the six questions.

Evaluation of surveillance attributes.—Using a rating scale developed for this purpose, of fully meets needs (80–100%), partially meets needs (60–79%), does not meet needs (<59%) and not applicable, we evaluated the ten attributes (Table 3) of a public health surveillance system as stated in the CDC Guidelines [10].

Acceptability was rated as 'fully meets the needs': On average 87% (77–93%) of all WHO Member States (195) fully participate in the process of reporting data into the GDBS [1, 5, 11–14].

Data Quality was rated as 'partially meets the needs': The GDBS data quality was rated 'partially meets the needs' because at the central level, the data are cleaned with routinely conducted data checks. However, at the WHO Member State level data reported into the GDBS often times only represents data collected at the NBTS and excludes data on blood safety activity conducted in the private sector. Some WHO Member States have blood safety information systems that make the collection, analysis and report generation easier and more accurate, whereas others have less automated systems with a number of choke points for error.

Simplicity was rated as 'partially meets the needs': The data information flow is simple at the level of WHO headquarters in Geneva and at the WHO Member State level. NBTS collect data that are reported to health authorities who subsequently report the data to WHO. However, the GDBS's simplicity is dependent on the existing funding, infrastructure and reporting mechanism of the individual NBTS of the Member State. For example, Member States whose NBTS depends on a paper-based system may find it difficult to provide the data required for the country to submit into the GDBS. Therefore, the rating is 'partially meets the needs', the system meets the needs when the mechanism for data flow exists within Member States.

Flexibility was rated as 'fully meets the needs': Over the past decade, the GDBS has adapted to changing needs in the field of blood safety and public health, making significant changes at four different time points. The GDBS has also adapted to advances in technology by transitioning to web-based electronic data collection and availability of forms in multiple languages.

Informatics was rated as 'partially meets the needs': The GDBS was rated as 'partially meets the needs', because the data housed in the GDBS at headquarters are comprehensive, spanning 20 years and over 195 WHO Member States on secure servers. However, the data quality reported into the system is dependent upon the existing funding, infrastructure and health systems in WHO Member States. Unfortunately, there does not exist a universally agreed upon computerized blood bank information management system that all WHO Member States could use. Instead, WHO Member States and WHO regions use different commercial systems for data collection, tracking and monitoring.

Positive Value Predictive (PVP) was rated as 'not applicable': The PVP for the GDBS could not be calculated due to factors, such as the GDBS not capturing data on a

single disease; multiple indicators being captured; testing algorithms between countries varying greatly.

Representativeness was rated as 'fully meets the needs': The objective of the GDBS is to provide information and guidance pertaining to the status of adequate and safe blood. The GDBS has a global reach extending over all six regions and including all 195 WHO Member States (2018). The 2016 GDBS status report included data from 180 countries representing a total population of 7 billion or 98·3% of the global population [1]. This does not take into consideration blood collected within the private sector and only refers to blood collections made in the public sector; however, it is representative of public sector data and adequate and safe blood availability in countries.

Timeliness was rated as does 'not meet the needs': The need to provide an update on the status on adequate and safe blood at a regular interval is a critical objective of the GDBS. WHO Member States do not have a fixed timeline for reporting; instead, they are encouraged to report data on a yearly basis. Reporting times from WHO Member States into the central GDBS varied from one year to eighteen months. Thus, the variability in reporting leads to the inability to publish the data on a regular interval.

Sensitivity was rated as 'fully meets the needs': Sensitivity can be defined as the probability that a positive result occurs when the condition actually exist. Given the complexity of the GDBS and the large number of indicators monitored, sensitivity could not be calculated in the traditional sense.

Therefore, for the purpose of the calculating sensitivity, we used self-reported published data provided by NBTS from the President's Emergency Plan for AIDS Relief (PEPFAR) supported countries in the AFRO region as the gold standard and data reported into the GDBS from the same subset of countries. We used purposive selection of the countries based upon the accessibility of data, representation of national blood donations (100% of donations in the country are collected in the public sector with no blood collections conducted by the private sector), and similarity of reported indicators. To calculate the sensitivity of the GDBS, we used select indicators as a proxy for the whole database. The selected indicators used were 'Units of Blood Donated' and 'Units Screened'.

The objective of this exercise was to estimate the ratio of the (blood donated: NBTS) to the (blood donated: GDBS. A ratio greater than 1·0 suggest that (blood donated: NBTS > GDBS), a ratio less than 1·0 indicates that the (blood donated: NBTS < GDBS), and a ratio of 1·0 means that (blood donated: NBTS = GDBS). In the following calculations, we are using a ratio of NBTS/GDBS. To demonstrate this, the ratio of (blood donated NBTS) to (blood donated reported to GDBS) in country A is 1·148, which means that self-reported data from NBTS recorded 14·8% more total blood donations than the GDBS. In contrast, the ratio in country B is 0·844, which suggests that the GDBS captured 15·6% (1 – 0·844 = 0·156 × 100 = 15·6%) fewer total donated blood units reported as compared with NBTS. In country C, the ratio was far less 0·3% (1 – 0·997 = 0·003 × 100 = 0·3%) which suggests that self-reported data from NBTS captured 0·3% less total donated blood units reported compared with GDBS. Six out of the nine countries had ratios of 1·0, suggesting that the

majority of the countries captured by the NBTS and GDBS were reporting the same figures. Three countries detected differences across the indicator ‘Blood donated’.

When using the same method to compare the ratio of the (Units Screened for TTIs: NBTS) to the (Units Screened for TTIs: GDBS) the findings were similar. The ratio of ‘screened units’ (NBTS: GDBS) in country A was 1·092, which means that the self-reported NBTS data recorded 9·2% more units screened than the GDBS. In contrast, the ratio in country B is 0·824, which suggests that the self-reported NBTS data captured 17·6 (1 – 0·824 = 0·176 × 100 = 17·6%) fewer units screened as compared with GDBS. In country C, the ratio was far less 0·996, which suggest that the NBTS captured 0·4% (1 – 0·996 = 0·004 × 100 = 0·4%) fewer units screened than NBTS. Six out of the nine countries had ratios of 1·0, suggesting again that the majority of countries captured by the NBTS and GDBS are reporting the same figures with differences only in three out of the nine countries.

Overall, we see that for the indicators ‘Blood donation’ and ‘Units screened’, respectively, 92·8% and 91·2% of the time data captured by the self-reported NBTS and GDBS are reporting the same figures. Therefore, we could conclude that sensitivity of the GDBS is high given that six out nine countries report accurate data.

Stability was rated as ‘fully meets the needs’: Since its inception and implementation, the GDBS has not experienced any interruptions or delays in accessibility of data with comprehensive reports published regularly at 2-year intervals covering data from a year. There have been no reported instances of loss of data or issues with the web-based system for data submission.

Five out of the ten attributes were rated as ‘fully meets the needs’, three were rated as ‘partially meets needs’, one was rated as ‘does not meet needs’, and one was ‘not applicable’. Three of the priority attributes (flexibility, acceptability, stability) were rated as ‘fully meets the needs’ and simplicity was rated as ‘partially meets the needs’.

Task E and F. Justify and state conclusions and recommendations, and ensure the use of the evaluation findings—The GDBS was established in 1997 to address global concerns about the availability, safety and accessibility of blood transfusions. The CDC Guidelines were used to assess the GDBS’ ability to function as a potential surveillance system. The findings from this review show that the GDBS meets six of the priority attributes that define a surveillance system as being useful. Overall, six out of the eleven attributes (fully met), three (partially met), one (not applicable), and only one (did not meet) the criteria by which the GDBS was evaluated. The results show that the GDBS is an effective public health activity that has the potential to serve as a surveillance system for capturing information concerning blood availability, safety, haemovigilance and accessibility. The GDBS also serves the role of providing effective feedback to the WHO Member States via analysis and recommendations prepared by experts from the transfusion medicine community. Major stakeholders described the GDBS as a unique activity that captures a wide range of information on all aspects of blood transfusion including, collection, screening, distribution and haemovigilance not only on a local level but at global one [15].

The GDBS exceeded the CDC Guidelines for the minimum requirement of a system's usefulness by successfully answering all six questions meant to establish if a surveillance system is useful. Further review also revealed that the GDBS was acceptable, flexible and stable and had a high representativeness among WHO Member States. According to the standards stated in the CDC Guidelines these attributes indicate that the GDBS activity is useful and provides vital information for public health action. Overall, the GDBS meets the needs of the stakeholders, although the timeliness and data quality could be improved.

Discussion

Public health information systems are designed to provide specific information on a particular health condition(s) that affect a large population. The data from such systems ideally can be used to monitor trends, identify outbreaks, provide recommendations, develop and implement public health programmes/activities. The GDBS despite monitoring changing trends of the availability of safe blood globally was not designed to serve as a surveillance system; however, after fifteen years of serving as the only global blood safety database in existence and given the needs of the future, we should consider expanding its use beyond that of a database, to that of a blood safety surveillance system. The impact of the GDBS could be made broader by adapting its use to the of a surveillance system which would allow for serial analysis of progress made in the field of blood safety. Multiple studies cite the GDBS as a source of data when evaluating the status of blood safety across multiple countries [18–22]. The GDBS remains the single most comprehensive source of blood safety and availability data that is collected globally and serves as a critical source for monitoring trends and progress made in the field of safe blood transfusions. The GDBS though not designed as a surveillance system definitely meets the six essential criteria of usefulness of public health surveillance systems. The GDBS evidently is a unique activity that collects information from all regions of the world while at the same time monitoring changing trends among diseases such as HIV, hepatitis B, hepatitis C and syphilis in blood donations and serves functions very similar to that of a proxy surveillance system. According to the GDBS status reports, HIV prevalence among blood donors in low-income countries form 11% in 2004–2005 to 1·08% in 2016 [1,13]. The impact of WHO blood safety policies have been captured by the GDBS in aspects of blood transfusions such as: nationally coordinated blood transfusion services; collection of blood from voluntary non-remunerated blood donors; testing and screening of all blood donors for blood grouping and TTIs; and reduction in unnecessary transfusions [23].

The data housed in the GDBS serve an important public health role in monitoring the safety and availability of blood and has the potential to serve as an important global surveillance system for blood safety. The GDBS has greatly influenced the availability of safe blood in the field of HIV transmissions, via policy, guidelines and advocacy for safe blood that results from the availability of data [24]. Research shows that almost 500,000 potential HIV infections via blood transfusions are averted in SSA through the adoption of simple blood safety measures in voluntary blood donation, blood donor selection and quality assured testing of donated blood [24].

Public health programmes can be evaluated for the effectiveness and impact of interventions, policies and public health strategy [16]. Since its establishment the GDBS has not been formally evaluated as to its impact on global blood safety as stated in its objectives. The CDC Guidelines provided a standardized framework for evaluating all attributes of the GDBS while also allowing the database to be evaluated as a surveillance system. Of the ten attributes evaluated, six fully met the needs of the system with only one attribute, timeliness not meeting the need. Paper-based systems which are used in some Member States are often too slow for analysis to guide urgent action and are difficult to maintain [17]. A well-designed electronic information system facilitates a streamlined data entry process or the direct digital capture of laboratory tests results; efficient data merge capabilities from multiple data sources; automated data quality checks; rapid search, retrieval and visualization capabilities; and early warning alerts for potential outbreaks [10, 17]. Increased commitments and investments by Member States into NBTS electronic information systems is needed for countries who struggle to provide complete and timely data. There is a critical need for governments and development donors to invest in support for information management systems for NBTS and mechanisms for improving data collection, donor and recipient tracking, and hemovigilance at hospitals 2. One of the benefits of routine collection of data from multiple Member States is the ability to use the data for making policy changes, targeted interventions and advocacy. However, despite decades of data collection by the GDBS, research has shown the need for systematic data capture, analysis, and data visualization methods which tend to hinder its goals and objectives [2,4,22]. The GDBS should consider modernizing its data capture and the use of data visualization, to improve its timeliness of reporting and use of data for advocacy.

Conclusions

Our evaluation indicated that the GDBS met five out of the six criteria set forth by the CDC Guidelines for a surveillance system to be defined as useful. The GBDS also met eight out of the nine attributes used for evaluating the completeness of a public health surveillance system. Though the GDBS has been monitoring the availability, safety and accessibility of blood in all Member States globally for the past two decades successfully meeting its objectives, it may be time to strengthen the activity to that of a surveillance system.

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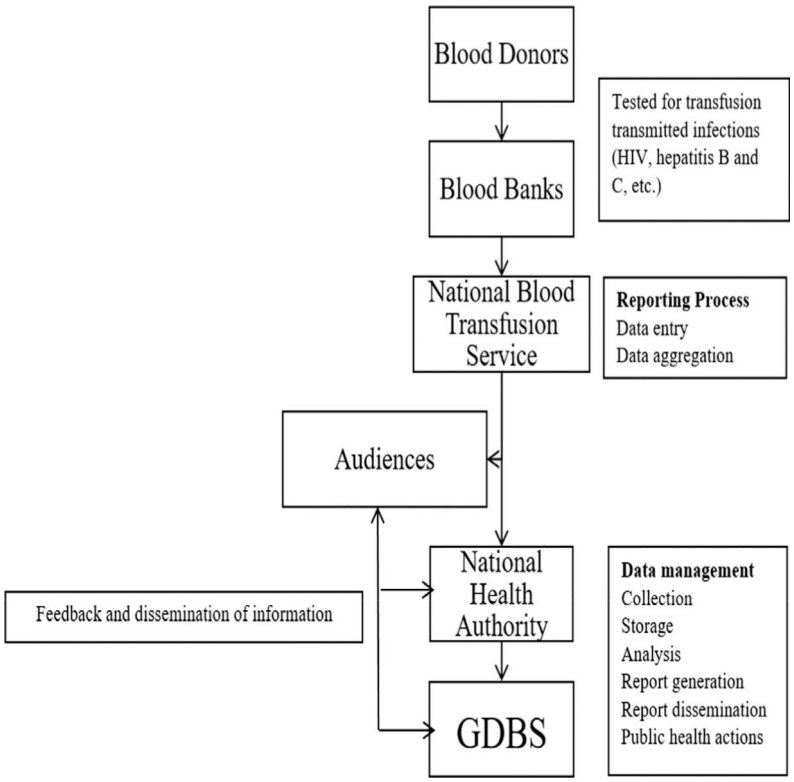

Fig. 1.
Simplified chart for data flow within the Global Database on Blood Safety (GDBS).

Table 1

Programme logic model showing activity objectives, resources, activities and outputs: Global Database on Blood Safety

Objectives	Collect and analyse data from all Member States on blood and blood product safety as the basis for effective action to improve blood transfusion services globally
	To assess the global situation on blood safety
	To obtain the best available information on blood transfusion services in each Member State
	To identify problems and needs in order to provide appropriate technical support
	To identify countries for priority assistance
	To monitor progress and trends in blood safety
Resources	Funding to support activity at central level (WHO)
	Funding to support activities both at central and country level (CDC)
	Funding at country level (MOH and NBTS)
	Technical Blood Safety Advisor
	Administrative staff at Member State health ministries
	Blood Transfusion Service Staff
	Supplies and Equipment
Activities	Disseminate data reporting forms to NBTSs
	Collect and aggregate data
	Provide reminders for delayed reporting
	Analyse, interpret data and generate reports
	Provide recommendations based upon emerging trends and evidence-based research
	Provide technical support to countries
Outputs	Recommendations for improving blood safety
	Assist Member States prioritize their needs in strengthening NBTS
	Provides yearly updates to CDC on priority countries
	Published updates available to public via WHO websites
Short-term outcomes	Early detection of changing trends in blood safety In some countries, only source of data on diseases such as hepatitis B and hepatitis C
Middle-term outcomes	Understanding of changing priorities and needs
	Identification of trends in transfusion-transmitted infections
	Adequate availability of blood
Long-term outcomes	Potential to identify shortages in global blood availability
	Potential to become a global surveillance system for blood safety

	Potential to identify emerging trends in blood safety and availability

CDC, Centers for Disease Control and Prevention; MOH, Ministry of Health; NBTS, National Blood Transfusion Services; WHO, World Health Organization.

Table 2

Measure of GDBS usefulness

Questions from CDC[a] Guidelines	GDBS answers	Evidence[b]	Measure
Detects diseases, injuries, or adverse or protective exposures of public health importance in a timely manner	The GDBS detects diseases and adverse exposures of public health importance. The GDBS monitors TTIs and hemovigilance.	Screening for transfusion transmitted infections increased from 54% in 1998, to 91% in 2016 Globally, 2013 it is estimated that 1.8 million blood donations collected were discarded due to transfusion-transmissible infection reactivity	√
Detect trends that signal changes in occurrence of disease, including the detection of epidemics	The GDBS collects and analyzes data on four TTIs in all member states	In 1998–1999, 40% of LMIC did not screen for all four TTIs, while in 2016 only 7% did not screen for TTIs In 2016, GDBS noted that the prevalence of the four TTIs in low-income countries was 1.08% (HIV), 3.74% (HBV), 1.03% (HCV), and 0.90% (syphilis)	√
Lead to improved clinical behavioral, social, policy or environmental practices	The GDBS has led to implementation and adaption of the following policies: national blood policy, screening policy, and hemovigilance policy to name a few.	In 1998–1999, a total of 106 countries reported that national blood policy had been developed versus 145 countries in 2001–2002 In 2004–2005, only 49% had a policy on the clinical use of blood while in 2016, 70% had such a policy	√
Provide estimates of the magnitude of morbidity and mortality, and identification of events under surveillance	The GDBS monitors the magnitude or transfusion-transmitted infections and adverse events.	In 2013, the GDBS 39% (70 of 180) countries reported data on adverse events	√
Permit assessment of the effect of prevention and control programs	The GDBS collects and analyzes data on quality assurance and monitoring	In 2016, a total of 155 countries reported the existence of national standards for collection, testing, processing, storage and distribution of blood and blood products	√
Stimulate research intended to lead to prevention and control	The GDBS stimulates research in the field of transfusion medicine intended to lead to prevention and control programs.	The GDBS has stimulated much research around the blood donors and the clinical use of blood	√

Abbreviations: GDBS = Global Database on Blood Safety; LMIC = Low and Middle Income Countries; NBTS = National Blood Transfusion Services; TTI = Transfusion TransmittedInfections √ = yes meets criteria set by CDC guidelines

[a] German RR, Lee LM, Horan JM, et al. Updated guidelines for evaluating public health surveillance systems: recommendations from the Guidelines Working Group. *MMWR Recomm reports Morb Mortal Wkly report Recomm reports*. 2001.

[b] World Health Organization. *Global Status Report on Blood Safety and Availability*. Geneva; 2016. http://www.who.int/bloodsafety/global_database/en/.

Table 3

Summary of CDC[a] guidelines attributes, definition and GDBS rating

Attribute	Definition	GDBS Rating
Acceptability	Willingness to participate in the activity	Fully meets the needs
Data Quality	Completeness and validity of the data	Partially meets the needs
Flexibility	Adaptability to changing information needs	Fully meets the needs
Informatics	User experience	Partially meets the needs
Positive Value Predictive	Proportion of reported cases that actually have the health-related event under surveillance	Not applicable
Representativeness	The occurrences of the health event over time and its distribution in the population	Fully meets the needs
Simplicity	Ease of activity operation	Partially meets the needs
Sensitivity	Proportion of reported cases of a disease detected by the system	Fully meets the needs
Stability	System reliability (i.e. the ability to collect, manage and provide data properly without failure) and availability (ability to be operational when needed)	Fully meets the needs
Timeliness	Speed between steps in as system	Does not meet the needs
Usefulness	Value, or practicality of the information generated	Fully meets the needs

GDBS, Global Database on Blood Safety.

[a]German RR, Lee LM, Horan JM, et al. Updated guidelines for evaluating public health surveillance systems: recommendations from the Guidelines Working Group. *MMWR Recomm reports Morb Mortal Wkly report Recomm reports*. 2001.