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A STUDY OF SERVICE QUALITY OF BLOOD BANKS

Abstract: Indian blood transfusion service industry is not able to meet the needs of the society and is still reliant, at least partially, on professional donors. Hence, major focus has to be on encouraging voluntary donors and increasing the supply. To this end, the quality of blood collection service needs to be assuring, hygienic and efficient in order to attract the potential donors. Authors believe the industry being not competitive, lacks incentives to be modern, resulting in fear psychosis, low supply, diseconomies of scale and higher cost of production. The government, by forcing and ensuring highest standards, can help achieve greater voluntary donation resulting in benefits to the industry and to the recipients.

The objective of the study is to measure the quality of service provided by the blood banks to the donors of the blood. The research is directed at measuring the costumers' perception of service quality, relative importance of its dimensions and identifying the best practices applicable for blood banks. The research is empirical in nature and is based on administering the modified SERVQUAL instruments on more than 300 blood donors. Using statistical analysis, the paper evaluates the processes at different blood banks.

Keywords: Service Quality, Blood Bank, SERVQUAL, India

1. Introduction

Quality of a product or a service is important both for customer satisfaction, for market share, profits and growth. Service sector, presently contributes even more than the manufacturing sector to the national income of developed countries and advanced developing countries. In most of these countries, contribution of service sector exceeds 70 percent of total GDP of a nation. Banks and other financial institutions, educational institutions, health sector, transport, tourism and hotels are some of the important service sectors. Customers prefer a high quality service and are willing to pay for better services.

Health is important for well-being of an individual. Good health keeps an individual in good spirits, enhances his/her social interactions, increases life span, reduces budget constraint, improves productivity and capacity to earn, and usefully contributes to society in general and country's GDP in particular. Just like any machine, the body also depreciates over time and faces diminishing capability, wear and tear and ultimate demise. All these have attendant costs and results in welfare. Hence, good healthcare system is essential in any society.

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All the countries world over recognize the need for healthcare facilities and the crucial role of the government. The average spend on healthcare is about 10-11 percent of GDP in all advanced countries (17-18 percent in USA) and 80 percent of this spend is by the government. In India, due to its lower per capita income, healthcare expenditure is about 3.8 percent, of which the government share is about 30 percent.

Healthcare delivery includes providing primary and secondary healthcare, hospitals, medical professionals (doctors, nurses and support staff), other physical infrastructure, research institutions, medical colleges, medicines, funds and resources, etc. An important part of this system is supply of blood to the needy patients. Blood is the primary vehicle in the body for supply of vital oxygen and transport of other nutrients and components to different parts of the body. Immediate supply of replacement blood is necessary to save a life, especially when there is a large loss of blood.as in the case of accident victims and women during delivery could lose large quantity of blood which needs to be immediately replaced. Also, for diseases like leukemia and thalassemia a patient may require continuous blood supply for a long period of time. For certain diseases and medical conditions, components of blood e.g., platelets, may need to be supplied to patients.

1.1 Blood Transfusion Services In India

Blood transfusion services though having limited capacity has been well established all over the country. The services are decentralized and fragmented without strong clear guidelines and control mechanism. It lacks adequate facilities, manpower, financial resources and infrastructure. Standards vary across the states, cities. Though many large hospitals have been established both in public and private sectors, many of them do not provide blood collection services and rely on outside support. As a result, there are a large number of private players who are small and not necessarily well equipped have been established in major cities. Equally, in most of the rural areas, the blood collection system is highly inadequate and largely through the government healthcare system. Most of these, even the long established centres do not have facilities and skills for separation of components of blood, due to inadequate physical facilities and trained manpower.

1.2 Regulatory Framework and Blood Safety Programmes

Till 1987, blood banking was largely unregulated. It was then realized that Blood Safety was of paramount importance and safety Programme became a focus. As a first step, the government launched National AIDS Prevention and Control Programme (NACO) in 1987 in view of the growing concern about AIDS. NACO launched a Blood Safety and Quality Assurance Programme in 1992 for a period of 7 years National AIDS Control Programme (NACP-I,1992-1999). Its objective was to help modernize the existing blood banks and set guidelines for safety in blood transfusion service. Under this programme, NACO modernized 815 blood banks (282 major city banks and 533 district level banks) owned by public sector and charitable trusts (e.g. Red cross), 40 Blood separation units were established.

Later, National AIDS Control Programme (NACP-II) was launched in 1999 to further modernize the blood transfusion system. The Supreme Court of India passed an order in 1992 directing the Government to improve blood transfusion services (in response to a Common Cause Case filed against the Government of India). Subsequently, NACO developed National Blood Policy (NBP) in 2002, revised in 2007. Consequent to the Court Order and NBP, National Blood Transfusion Centre (NBTC) and State level State Blood Transfusion Centre (SBTCs) were created to develop policies and

programmes for improving blood-transfusion services in India. Blood Storage Centres (BSC) have been established to supply blood on demand from First Referral units (FRU) which are the Community Health Centres to cater to the village residents, who are largely poor. Their major requirement of blood is for women during pregnancy.

Three major objectives of the integrated strategy for blood transfusion service are:

1) Blood should be collected only from voluntary blood donors and they should not be remunerated. This is in line with WHO guidelines that contribution from professional donors should be progressively reduced to zero since theirs is a high risk blood.
2) The collected blood should be screened for all transmitted infections from transfusion. This is to ensure the safety of the receiver.
3) All unnecessary transfusion should be avoided. This will reduce pressure on supply as well as reduce the risk and cost to the recipient.

Blood is internally transmitted and hence Blood and Blood components are classified as "Drugs" under section 3(B) of the Drugs and Cosmetics Act, 1940. It was realized that there should be a central regulatory authority for blood and safety was so critical that the blood industry had to be under supervision. Towards that goal, the Drug Controller General was vested with the power of licensing blood banks (blood and blood products) in 1992. Blood is considered a drug, hence all Blood Banks require a license from the Drug Controller (a government organization) to operate which needs to be renewed from time to time (every five years). The National Blood Transfusion Council (NBTC), established in accordance with the agreed national blood policy and within a legislative framework, has the major advisory role in the formulation of policy on safe blood-transfusion services in India.

Healthcare systems are modern and sophisticated in the urban centres of India. However, about 65 percent of population lives in villages in India. Most villages are small, most inhabitants poor or near poor and can ill afford large health expenditure. The government, has established extensive health services. For every 30000 population, there is one Primary Health Centre (PHC), which can provide primary health care and child birth facility. They are supported by sub centres, one for every 5000 population. For every 3 to 4 PHC, there is one Community Health Centre (CHC), normally located at taluka headquarters (a town). CHC also acts as a Fist Referral Unit (FRU) and for each FRU there is a Blood Storage Unit (BSU). The responsibility for blood supply for blood-storage centres at the FRUs lies with the government/national health authority, viz., Regional Blood Transfusion Centres (RBTCs). BSU are also regulated and are licensed by RBTCs subject to meeting quality requirements for storage and supply.

In Gujarat (a state of India where this study was undertaken), blood transfusion services are under Gujarat State Council for Blood Transfusion, a government organization. Gujarat ranks second in India in terms of blood collection. 65 percent of blood collected is voluntary.

1.3 Blood Transfusion Process

The entire supply chain has four major steps:

1) Identifying the individual blood donors and making arrangements for collection of the blood from these donors.
   a. The donor should be clearly not at a disadvantaged for donating the blood. This requires that :
   b. Donor's medical records must be checked for his/her acceptability as a donor. He/she should not have donated in recent past, he/she does not have specific diseases e.g., heart conditions, which could worsen on donation.

c. The actual process should be simple and easy to understand and implement as follows:
  i. Registration
  ii. Medical History and physical checkup, especially checking for temperature, pulse, Blood Pressure, Hemoglobin Count, weight, etc.
  iii. Actual blood collection
  iv. Rest and refreshment
  v. Needle used must be fresh, sterile and used only once and discarded.
  vi. The surrounding atmosphere must be hygienic.
  vii. A doctor should be present all the time of donations to attend to any medical exigency.
  viii. The process should be efficient and donors should not have to waste time unnecessarily.

2) Identifying the individual blood donors and making arrangements for collection of the blood from these donors.
   a. Blood should be checked for malaria, hepatitis, TB, AIDS and a report card should be sent to all donors for their knowledge.

3) Separation of the blood in in its components. Generally, a patient may not require wholesome blood but only a specific component, say, white blood cells. A typical collection may serve four different types of patients if there is adequate facility for separation of blood in its components.

4) Supply to the needy hospitals and patients' Blood Donation Process

This process, unfortunately, is not religiously followed, both in letter and in spirit, in many blood banks in India.

1.4 Demand for blood

We assume that average blood collection is 450 ml, called 1 Unit. It is estimated that India needs at least 45 million units of blood every year (about 18 million liters per annum), about 50000 liters per day. It is estimated that blood is required once in every two seconds somewhere in India. Since healthcare facilities may not be adequate in rural India, actual requirement could be much larger at potential demand. For 50000 liters per day, about 110000 donations are required per day. Requirement is large due to large population, large number of accidents per 1000 vehicles, increasing number of cancer (leukemia) and thalassemia patients etc.

Not all patients require whole blood. Blood has four component products which can be transfused: red cells, platelets, plasma and cryoprecipitate. Typically, from a unit of whole blood at least three different components can be separated, thus saving, potentially, three lives.

In apheresis process, a donor donates only a specific component and not the whole blood. Blood is taken out from one side, processed and a component removed, and re-transfused from the other side. The authors have not found such facilities in India (though it may exist at some hospitals in India).

1.5 Supply of blood

Studies have found that easy and safe blood availability is rare in India. In India, annual demand is 12 million units and collection is 9 million units (in 2012, up from 6 million in 2005), 75 percent of the requirement. Blood collection in major blood-banks is between 5,000 and 10,000 units per annum and in the district-level blood-banks between 3,000 and 5,000 units per annum. Voluntary blood donation should be the primary source of supply. WHO has estimated that if 1 % of the population donates blood that should be sufficient to meet the needs. Thus, 10 people per 1000 people should donate. In many countries, actual donors are in excess of WHO norms. Switzerland has 113 donors per 1000 population, Japan has 70, Australia 58, UK 40, Singapore 24, Mexico 10 but only 7.5 in India per 1000 population. Thus, in India, total donation is only 75 % of the

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required as per WHO norms and only 2/3rd of this blood is through voluntary donation. (Indian Red Cross Society is the largest among blood collection, has 166 blood banks across the nation. More than 90 percent of blood collected at Red Cross is voluntary).

1.6 Need for the study

As discussed, demand for blood far outstrips the supply. Many patients do not get blood in timely fashion resulting in undesired consequences. That calls for a large set of donors who regularly donate blood and an even larger set who donate at least occasionally, say on birthday. However, due to several reasons, blood collection is not adequate. One, at many places, especially in rural areas, blood collection is far remote and hence costly for an individual donor, who may be poor in first place. Second, ignorance. Many people simply are unaware of the need to donate and donate regularly. This may be due to lack of general education, relatively low literacy rate and lack of awareness of the process. Third, fear. Many fear that blood donation may cause medical problem. This fear is widespread and even among highly educated people and the young collegians.

Second, it was estimated that in 2004-05, 2.07 percent of AIDS disease in India was due to unsafe blood transfusion, down from 9 percent in 1999. Today (2013) voluntary donation has reached 80 percent in many areas, however overall average is only about 65 percent. One way the quality of blood can be ensured or at least improved is if all the donation is voluntary.

One of the author of this study has donated more than 100 times, both in USA and in India. He has observed stark contrast in different places of collection. At least at one place in India, for many years, nurse would only record the statement of the donor about his/her health and would not cross check for, say, blood pressure. A form is filled by a donor but not verified by the nurse/doctor. At another place, room appeared to be so

unclean (in general as well as in comparison to other blood collection centres) that unless the donor is so determined he/she would withdraw. Even today, report on some of the tests are not shared with the donor by all collection centres.

One of the clear reasons for inadequate voluntary donation is lack of assured feeling for a donor, fear of unknown, fear of getting a medical problem and doubts about the processes (e.g., is needle sterile).

Equally, on the demand side, the potential user must be confident that the process of collection is hygienic, proper, blood is from a healthy person, is properly tested etc.

It is important that the highest quality of service is offered by these blood banks in order to attract donors and protect the health of donors and receivers. However, it is observed that the service quality differ widely from blood bank to blood bank. It is necessary to establish whether the various blood banks offer the requisite quality of service. There are no standard norms for doing so and a better way is to assess the customer's perception about the service quality. The present study is about the quality of service provided by the blood banks to the donors of blood. The study is based on the use of SERVQUAL Scale. The study makes an attempt to measure the service quality being provided by the blood banks in Ahmedabad, a city with a population of about 5 million in Western part of India. A larger number of respondents, users of the services have been surveyed to understand their experience of blood donation services through a well-documented service quality measurement scale namely SERVQUAL. SERVQUAL was originally proposed by Parsuraman et al, in 1988 and was developed for application in a commercial environment and requires its adaptation in the non-commercial environment like that of blood collection services. Thus the study should answer the following basic questions:

1) How can we increase the supply base?
2) Is the blood collection process proper, efficient and hygienic?
3) Is the blood stored, tested before transfusion and supplied before expiry?
4) Are there facilities for separation of blood components so that total number of patients who can benefit from the same base supply increases?
5) Is blood collection process reassuring to the donor? To the Recipient?

These questions are difficult to answer on objective basis as many of the answers cannot be quantified, are based on observations and perceptions. Second, the perceptions can be either of the donors or of doctors/nurses involved in the processes and collection and transfusion or of the recipient patients.

This study is based on the processes at the blood collection points. Obviously, the recipient patients and or attending doctors/nurses have no first hand direct knowledge of the collection. The doctors/nurses who are involved in the collection may be biased. Hence, the best response may come from the donors themselves. Thus, this study is based on the perceptions, observations and experience of the donors. The study, thus:

- Is a subjective study.
- Examines the processes during the collection phase only and does not examine the recipient end.
- Does not examine the processes after the blood collection where the donor is not involved.
- Does not consider the opinion of the doctors/nurses/staff involved in the collection.

2. Objectives of the study

The basic objective of the study is to measure the quality of service provided by the blood banks to the donors of the blood. Specifically, the research is directed at:

1) Measuring the costumers' perception of service quality based on gap between expectation and perception.
2) Examining the relative importance of different dimensions of service quality based on the weighted service quality scores.
3) Critically examining, through factor analysis, the dimensionality of the service quality for blood banks.
4) Identifying the best practices through benchmarking analysis.
5) Examining whether there is any difference in the service quality offered by different blood banks (**Hypothesis 1**).
6) Examining whether there is any difference in the service quality as experienced by different age groups of respondents (**Hypothesis 2**).
7) Examining whether there is any difference in the service quality as experienced by different education groups of respondents (**Hypothesis 3**).
8) Examining whether there is any difference in the service quality as experienced by different occupation groups of respondents (**Hypothesis 4**).
9) Examining whether there is any difference in the service quality as experienced by different gender groups of respondents (**Hypothesis 5**).

3. Review of literature

Quality is well defined for a physical product and its measurement is specified by set standards. However, defining service quality and its measurement have posed several

conceptual and methodological problems. Many a product are pure service products, e.g., education, and many physical products may also require supply of accompanying services, e.g., supply chain. Grönroos (1984) were the first to suggest that the service quality can be measured by comparing the customer expectation about the quality of service and their perception of quality supplied. Grönroos further suggested that "service quality" comprises of three global dimensions. The first dimension is the technical quality. This dimension refers to the outcome or what is delivered or what the customer gets from the service. The next dimension is the functional quality, which refers to the manner in which the service is delivered or how it is delivered. The third dimension is the image of the product.

The service quality models can be based on the following three underlying themes:

1) Service quality is more difficult for the consumer to evaluate than quality of physical goods;
2) Service quality perceptions result from a comparison of consumer expectations with actual service performance;
3) Quality expectations are not made solely on the outcome of the service; they also involve evaluations of the process of the service provision.

Grönroos (1984) developed the first model, "Perceived Service Quality Model". The concept of measuring service quality was further developed by Parasuraman *et al*. (1985). Parasuraman further supported Grönroos' findings and developed "Gap Model". They followed this by developing the basic model of multiple-item scale of measuring consumer perception, named SERVQUAL (Parsuraman *et al*. 1988). Parasuraman *et al*. (1985) suggested that consumers measure service quality by using similar criteria irrespective of the type of service. From a series of focused group discussions, they grouped these criteria into 10 key categories, which they labeled as

"service quality determinants". The determinants were identified as reliability, responsiveness, competence, access, courtesy, communication, credibility, security, understanding/knowing the customer, and tangibles. Later, Parasuraman *et al*. (1988 and 1991) distinguished the service quality from quality of a good by three characteristics of service quality: heterogeneity, inseparability and intangibility. Consequently, they refined the dimensions to the following five:

Tangibles The appearance of physical facilities, equipment, appearance of personnel, and communication materials

Reliability The ability to perform the promised service dependably and accurately

Responsiveness The willingness to help customers and provide prompt service

Assurance The knowledge and courtesy of employees and their ability to inspire trust and confidence, and

Empathy The caring, individualized attention the firm provides to its customers.

Zeithmali and Bitter (2000) added one more dimension of the service quality, Perishability, because service can not be saved or stored. Grönroos (2001) and Grönroos (2007) suggested seven determinants for evaluation of service quality of an organization. Berry and Persuraman (1991) found that from among all the dimensions, "Reliability" is the most important dimension and is at the heart of the service quality. However, Babakus and Boller (1991) have questioned this finding and argued that the critical dimensions differ from industry to industry. Over the years, SERVQUAL has become a standard for measuring service quality. Seth *et al*. (2005) reviewed and compared nineteen different service quality models and set agenda for future research. There have been several criticism of SERVQUAL (Grönroos, 1990; Mangold and Babakus, 1991; Cronin and Taylor, 1992; Teas, 1993; Brady and Cronin, 2001) and they have developed different models of service quality. However, to date,

SERVQUAL continues to be a preferred model. American association of Blood Banks (2002) provided guidelines for good practices. Ravichandran and Srivastava (2005) and Singh and Das (discuss the development of and services provided by BBP Blood Centre, Ahmedabad, one of the preferred blood banks in India. Ramani *et al*. (2009) have studied the blood transfusion services in Maharashtra and Gujarat states of India.

Service quality measurement, monitoring and operationalization in health care industry were discussed by Lehtinen and Laitamaki (1985). John (1989) maintained importance of four dimensions of service quality in health care: Curing, Caring, Access and Physical environment. One of the first studies of service quality of hospitals using SERVQUAL was Reidenbach and Sandifer (1990). This was followed by Babakus and Glinmw (1992), study of hospitals in Belgium by Vandamme and Leunis (1993) and a study by Bowers *et al*. (1994). Anderson (1995) studied the quality of a university health clinic using SERVQUAL. Similarly, Youssef *et al.* (1995) and Sewell (1997) studied quality of NHS hospitals with SERVQUAL based instrument. Lim and Tang (2000) used modified SERVQUAL to study the service quality of hospitals in Singapore. They found gap between perception and expectations of patients. Jabnoun and Chaker (2003) have studied the service quality of hospitals in UAE using ten dimensional SERVQUAL and concluded that there was significant difference between qualities provided by hospitals.

Laohasirichaikul *et al*. (2010) have examined the service quality of hospitals in Thailand. Rohini and Mahadevappa (2006) have studied the quality of service provided by the hospitals in Bangalore, India. They have studied the quality of five hospitals using SERVQUAL for measuring gap between perception and expectation. The reliability was determined using Cronbach alpha coefficient. They had also tested for significant difference between services offered by different hospitals using simple one way ANOVA. They also tested the gap in management personnel's expectation about the expectation of the patients and patients' expectations using SERVQUAL. They concluded that there was significant gap between perception and expectations on all five dimensions and gap existed between perception of expectation and expectation.

Jabnoun and Chaker (2003), carried out comparative study of private and public hospitals using SERVEQUAL. The questionnaire contained five dimensions namely empathy, tangibles, reliabilities, administrative responsiveness and supporting skills. Study resulted that in-patients were generally unhappy on all dimensions of hospital services. The authors reported significant difference between service quality of public and private hospitals. Public hospitals outscored private hospitals on tangibles and reliabilities dimension mainly due to high government investment.

Sharma and Narang (2011), studied rural India (Seven districts of Uttar Pradesh) to assess the perception of patients towards quality of healthcare services. 'Healthcare delivery' and 'financial and physical access to care' significantly impacted the perception among men while among women it was 'healthcare delivery' and 'health personnel conduct and drug availability'. With improved income and education, the expectations of the respondents also increased. It was not merely the financial and physical access that was important but the manner of delivery, the availability of various facilities and the interpersonal and diagnostic aspect of care as well that mattered to the people with enhanced economic earnings. The overall quality of healthcare services was perceived to be better in Primary Healthcare Centres than in Community Healthcare Centres.

Taner and Antony (2006), carried out comparative study of private and public hospitals in Turkey with the help of

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SERVQUAL. Results of their research were that in-patients of private hospitals were more satisfied compared to the inpatients of public hospitals. The study also showed that satisfaction with doctors and costs were the main determinants of service quality in public hospitals.

Karassavidou *et al*. (2009), study with 1) to investigate how patients perceive service quality in Greek NHS hospitals; 2) to assess patients' perceptions, expectations and the relevant gaps concerning the quality provided by public hospitals; and 3) to determine the relative importance of quality dimensions in influencing patients' overall quality perceptions. Using SERVQUAL the study found human factor as the most critical dimension of quality, reflecting the significance of the traditional view of the Doctor-patient relationship.

Panchapakesan *et al*. (2009) studied perception of patients and their family members to understand dimensions of service quality for Indian hospitals. With literature review and discussion with patient and attendants they found that following dimensions of the hospital service quality:

- Infrastructure
- Personnel quality
- Process of clinical care
- Administrative procedures
- Safety indicators
- Corporate image
- Social responsibility
- Trustworthiness of the hospital.

Authors also proposed an instrument and conceptual framework based on the study. They modified items to suit the context of healthcare services.

Aagja and Garg (2010) developed a scale for measuring perceived service quality for public hospitals from the user's (patient's) perspective. The objective was to measure perceived service quality of public hospitals. A reliable and valid scale called public hospital service quality (PubHosQual) was developed to measure the five dimensions of hospital service quality: admission, medical service, overall service, discharge process, and social responsibility.

Panchapakesan *et al*. (2010), study had the objectives of conceptualizing hospital service quality (SQ) into its component dimensions from the perspectives of patients and their attendants; and to analyze the relationship between SQ and customer satisfaction (CS) in government and private hospitals in India. Their study resulted that patients and attendant treat interpersonal aspect of care as the most important measure as they would not understand the technical aspects associated with the services provided to them. Study also revealed that hospital service providers need to understand perspectives of patients as well as attendants to have a holistic view of the service.

Lee (2005) studied to test the applicability of the SERVQUAL conceptualization to a less studied area–medical service in a developing country. The study empirically investigated the usefulness of SERVQUAL conceptualization by testing both the presence of five SERVQUAL factors (tangibles, reliability, responsiveness, assurance and empathy) and the stability of those factors as evidenced by the scale's reliability. Study also found that major attributes affecting service quality would also include "modern facilities", "being able to trust doctors", "employees getting adequate support from the hospital", "willingness to help patients", and "being dependable".

Rohini and Mahadevappa (2006) carried out gap analysis for Banglore (India) based five hospitals using SERVQUAL. Their study found that there were service quality gap between patient's perception and expectation. Study also revealed that gap also exist between management's perceptions about patients' expectations and patients' expectations about service quality. The study suggested improvements across all five dimensions of service quality - tangibles, reliability, responsiveness, assurance and empathy.

Laspa and Priporas (2008) quoted that Simple Ratio Analysis (SRA) and Data Envelopment Analysis (DEA) were widely used in benchmarking to identify organizations with best practice. This study tested the consistency of the two methods by investigating whether they could substitute for each other in performance measurement. Optimality is investigated based on four performance outcomes: donor recruitment, blood sufficiency, wasted blood units and transfusion reactions. Comparison of SRA and DEA was employed in pair-wise efficiency scores. Results yielded high statistical significance under assumptions of both constant returns to scale and variable returns to scale. The results confirmed the two measuring techniques were closely related and consistent.

Published studies of quality provided by the blood banks are not many. Mququ (2006) had studied the quality of service provided by South African National Blood Services (SANBS). The study was aimed at analyzing the quality of service provided by SANBS to the hospitals, as perceived by the customer hospitals which used blood collected by SANBS, so that service can be improved, if necessary, to meet the customer expectations. The study was conducted in 2005 among 113 hospitals. The study based on ten dimensional model of SERVQUAL (modified for specific requirement of the industry) measured the gap between expectations and perception of the quality. It concluded that the perceived (based on experience) quality was lower than the expected one.

4. Methodology

Based on the popularity of the service quality questionnaire, the original SERVQUAL was used in a pilot test to a group of experts from the medical field, and based on their inputs the SERVQUAL questionnaire was modified a bit to suit the Indian blood bank environment. In this modified questionnaire, some of the items were reworded, while few new were added. The final questionnaire selected was consisting of 25 items, in six broad categories. The questionnaire was distributed to approximately 400 people (blood donors) who had donated blood at least once with any of the blood banks situated in Ahmedabad. However we will still be using the name of the modified questionnaire as the SERVQUAL. The list of donors was collected from different blood banks based on personal contacts of the authors. From this list some donors were drawn at random. The final analysis is based on a sample size of 311 respondents who returned the questionnaire complete in all respect. The respondents included were blood donors of different age, sex, education, and occupation. It may not be out of place to mention that one of the authors of the paper had donated blood dozens of times in the past more than three decades for social cause.

Microsoft Excel and SPSS (version 15) was used as the data analysis tool and the entire data had been cross tabulated for each demographic variable, separately, and bank wise for expected value, perceptual value, and the gap. Basic statistical measures, like, average, standard deviation and percentage analysis have been done. Different dimensions of the scale were rated based on the respondent's weighted service quality rating. The questionnaire was checked for its reliability, and validity. The entire data set based on service quality gap was subjected to principal component analysis to study how they converge into components. ANOVA tests had been applied to examine the statistical significance of the difference, if any, among the different blood banks. The SERVQUAL scale is based on pre-determined factors. However, these factors are generic in nature. Whether those factors really contribute, in the context of the study, was needed to be verified. Also, best practices needed to be identified through benchmarking analysis. Hence, principal component analysis has been applied to the entire data set based on gap (expectation

minus perception).

5. Results and discussions

5.1 Service Quality

The Table-1 above shows that the difference between total weighted SERVQUAL score (.7168) and total unweighted SERVQUAL score (.73) does not seem to be of much significance. The table makes it clear that

from the importance weight point of view the Reliability is the most important dimension (19.1), followed by Process (19), Tangible (17.4), Assurance and Empathy (both 15), and then Responsiveness (14.4). Based on the weighted service quality scores the highest gap is for Tangible (.1514), followed by Reliability (.1432), Empathy (.1425), Assurance (.123), Responsiveness (.107), and then Process (.05).

Table 1. Weighted Service Quality

Dimension of Service Quality (1)	Avg. Gap Score (E-P) (2)	Importance Weight (3)	Weighted Service Quality (2 * 3)
Tangible	**.87**	**17.4**	**.1514**
Reliability	**.75**	**19.1**	**.1432**
Responsiveness	**.74**	**14.4**	**.107**
Assurance	**.82**	**15**	**.123**
Empathy	**.95**	**15**	**.1425**
Process	**.26**	**19**	**.05**
Total	.73 (Avg.)	100 (rounded off)	.7168

To minimize and eliminate the gap in service quality management should try to know where the problem is. Whether it is in understanding expectations of the donors (market research gap), or lack of management commitment (service design gap), or lack of team work/ training or incompetence of the staff (conformance gap), or problem lied in communicating the benefits of the blood donation and then not living up to the raised expectations (communication gap).

5.2 Reliability and Multi-collinearity of Scale

We have tested the reliability of the instrument using Cronbach alpha. Cronbach alpha has been found to be 0.831. This reliability test was run on the data using SPSS software. The computer output gave Cronbach Alpha value of .831 (and the value was .857 based on Standardized Items) by

using all 25 items of the modified SERVQUAL instrument. This proves that the instrument used for our survey is quite reliable. Bivariate correlations were also computed among the seven factors identified in the study and it was found that no multi-collinearity was observed making it a suitable factor solution.

5.3 Principal Component Analysis

Principal Component Analysis, using Varimax Rotation has been conducted on the entire sample of 311 respondents. The results suggest existence of seven factors as against the established five factors in the original SERVQUAL Model. The results for testing the Sample Size adequacy, Total Variance Explained, and Rotated Component Matrix are being produced as follows: To understand the adequacy of sample size before performing factor analysis, we have used Kaiser-Meyer-Olkin measure of

sampling adequacy (KMO) using SPSS software. A value close to 1 indicates that patterns of correlations are relatively compact and so factor analysis should yield distinct & reliable factors. Kaiser (1974) recommends accepting values between .7 and .8 are good. The value of Kaiser-Meyer-Olkin (KMO) we got as the output of the test was 0.789, and on 300 degrees of freedom the Chi Square value of 3267.643 which had a statistical significance of .000. That means the test results indicated that the sampling adequacy is ensured in the analysis.

The computer output displayed the Bartlett's Test of Sphericity. For principal component analysis to work we need some relationships between variables and if the R-matrix were an identity matrix then all correlation coefficients would be zero (Andy, 2009). Therefore, we want this test to be significant (i.e. have a significance value less than .05). For the data Bartlett's test is highly significant ($p = 0.00$), and therefore data reduction technique we used is appropriate. We know that there are as many components (eigenvectors) in the R-matrix as there are variables, but all of them will not be very important. To determine the importance of a particular vector we look at the magnitude of the associated eigenvalue. We can then apply criteria to determine which factors to retain and which to discard. By default SPSS uses Kaiser's criterion of retaining factors with eigenvalues greater than one. The eigenvalues associated with each factor represent the variance explained by that particular linear component and SPSS also displays the eigenvalue in terms of percentage of variance explained. SPSS then extracts all factors with eigenvalues greater than 1, which left us with only seven factors (with a total of 65.598 % variance explained, Table 2).

Table 2. Principal Component Analysis' Rotated Components' Loading

Item	Component						
	1	2	3	4	5	6	7
Health Check of Donor	**.823**	.093	.046	.023	.103	-.052	-.073
Traceability of Donor	**.788**	-.069	.090	-.121	-.058	.120	.280
Doctor's Presence	**.689**	.139	.038	-.121	.048	.183	.338
Syringe Destroyed	**.612**	-.102	.050	.047	.179	-.120	.011
Discrimination	**.592**	-.016	-.183	.343	-.102	.176	-.009
Med. Report & Thanks	**.563**	-.291	.142	-.057	.022	-.009	.445
Error Free Records	.400	**.076**	.227	.274	-.049	.210	-.087
Physical Facility	.059	**.830**	.121	.171	.120	.110	.193
Modern Equipment	-.131	**.798**	.174	.258	.121	.136	.100
Appealing Equipment	-.002	**.797**	.175	.116	.109	.078	.015
Timeliness	-.042	.230	**.785**	.143	.031	.165	-.031
Sincere Interest	.189	.103	**.771**	.051	.168	.099	.172
First Time Right	.094	.092	**.734**	.274	.066	.109	.034
Promptness	-.021	.184	.192	**.795**	.037	.038	.070
Helping Attitude	.133	.167	.025	**.718**	.207	.038	.096
Readiness	-.053	.139	.252	**.660**	.042	.148	.116
Behavior	.115	.034	.069	-.040	**.793**	.012	-.197
Safety Feeling	.137	.233	.113	.164	**.784**	.111	.171

Item	Component						
	1	2	3	4	5	6	7
Always Courteous	-.070	.125	.114	.243	**.694**	.275	.203
Personal Attention	.144	.135	.114	.051	.098	**.867**	.080
Best Interest at Heart	.070	.076	.161	.172	.114	**.833**	-.004
Operating Hours	-.154	.206	.321	.010	.232	**.464**	.352
Worthiness	.035	.308	.121	.240	.099	-.091	**.671**
Neat Appearance	.192	.316	-.123	.080	.141	.119	**.621**
Knowledgeable	.242	-.183	.177	.091	-.271	.182	**.570**

Table-3. Multiple Comparisons

Method of Comparison	Between Type of Blood Banks		Significance
Tukey HSD	BBG	BBR	.053
		BBV	.004
		BBP	.000
Gabriel	BBG	BBR	.063
		BBV	.004
		BBP	.000
Hochberg	BBG	BBR	.063
		BBV	.004
		BBP	.000
Games-Howell	BBG	BBR	.015
		BBV	.001
		BBP	.000

Table-2 is a matrix of the factor loadings for each variable onto each factor. Stevens's (1992) suggests factor loadings greater than .4 represent substantive values. Looking at the content of questions that load onto the same factor; common theme was identified. Based on the common themes, these factors have been suitably named as follows:

1) Processes (12.982%)
2) Tangibles (10.447 %)
3) Reliability (9.114 %)
4) Responsiveness (8.839%)
5) Assurance (8.348 %)
6) Empathy (8.225 %)
7) Non-Verbal Communication (7.642 %)

Whether there is significant difference in the service quality as measured by the gap analysis of different blood banks. (Hypothesis 1).

H1o: There is no difference in the service quality offered by different blood banks.

H1a: There is a difference in the service quality of different blood banks.

Table-4 gives the descriptive statistics about the service quality of the four blood banks, as measured by the modified scale (to distinguish the blood banks we have used their code names); the table also gives the result of analysis of variance.

The Table shows that the mean value of the gaps is significantly different among the bloods banks. The lowest gap exists for BBP (0.4368) whereas that of the blood bank at

BBV Hospital is the highest (0.8980).

The variance analysis on different blood banks gives between groups (combined) F-ratio is 30.172, which is statistically significant at 0.00. This signifies that there is a difference in the service quality offered by different blood banks. Therefore Null Hypothesis-1 is rejected. There is a difference in the service quality offered by different blood banks. To know which pairs of blood banks differ in service quality we will do the Post Hoc analysis. Post Hoc analysis was carried out to know which two pairs of blood banks differ in their service quality (Table-3).

The multiple comparisons carried out using the Post-Hoc Analysis, as detailed in Table-3, proves that except for the pair of BBG and BBR, all other pairs of two blood banks have significant difference in the quality at 5% level of significance. Thus, e.g., there is significant difference between BBR and BBP, between BBG and BBP, between BBV and BBR

5.5 Service Quality across Demographic Factors

In addition to the overall service quality analysis as discussed above, additional analysis involving demographic factors have also been carried out, since the authors expect that there could be differences in the service quality gaps across age, education, occupation and gender.

- Whether there is any difference in the service quality as perceived by different age groups of blood donors (**Hypothesis 2**).
- Whether there is any difference in service quality as perceived by different education groups of blood donors (**Hypothesis 3**).
- Whether there is any difference in the service quality as perceived by different occupation groups of blood donors (**Hypothesis 4**).
- Whether there is any difference in service quality as perceived by different gender groups of respondents (**Hypothesis 5**).

5.5.1 ANOVA between Service Quality as perceived by different Age Groups

H2o: There is no difference in the service quality offered by blood banks as perceived by the different age groups

H2a: There is a difference in the service quality offered by blood banks as perceived by the different age groups.

ANOVA test proves that the difference between perceived service qualities by different age groups is not statistically significant. This is indicated in Tables-4.

Table 4. Service quality analysis

Demographic	DESCRIPTIVE				ANOVA			
	Category	N	Mean	SD	For	DOF	F-Val.	Sig.
Type of Blood Bank & Quality	**G**	**79**	**.7357**	**.2562**	Between Groups (Combined)	**3**	**30.172**	.000
	R	**87**	**.6156**	**.2523**				
	V	**82**	**.8980**	**.256**				
	P	**63**	**.4368**	**.4397**	Linear Trend (Unweighted)	**1**	**14.804**	.000
	Total	**311**	**.6844**	**.3413**				
Age & Quality	**0-25 Years**	**95**	**.7032**	**.3046**	Between Groups (Combined)	**2**	**2.516**	**.082**
	26-40	**167**	**.6525**	**.303**				
	41 & Above	**48**	**.7725**	**.486**				
	Total	**310**	**.6866**	**.3396**	Linear Trend (Unweighted)	**1**	**1.342**	**.248**

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Demographic	DESCRIPTIVE				ANOVA			
	Category	N	Mean	SD	For	DOF	F-Val.	Sig.
Education & Quality	**HS**	**39**	**.7467**	**.2967**	Between Groups (Combined)	3	1.638	.181
	UG	**48**	**.6692**	**.2668**				
	G	**160**	**.703**	**.3148**				
	PG	**63**	**.6095**	**.4595**				
	Total	**310**	**.6843**	**.3419**	Linear Trend (Unweighted)	1	3.063	.081
Occupation & Quality	**Svc.**	**162**	**.6798**	**.3667**	Between Groups (Combined)	4	.868	.483
	Business	**76**	**.6679**	**.3073**				
	Student	**53**	**.674**	**.2794**				
	Housewife	**13**	**.7754**	**.4695**				
	Other	**7**	**.88**	**.2142**				
	Total	**311**		**.3413**	Linear Trend (Unweighted)	1	3.222	.074
Gender & Quality	**Male**	**274**	**.6796**	**.3394**	Between Groups (Combined)	1	.457	.500
	Female	**37**	**.72**	**.3583**				
	Total	**311**	**.6844**	**.3413**	Linear Trend (Unweighted)	1	.457	.500

The outcome shown in Table-4 shows that we fail to reject null hypothesis of no difference (Hypothesis-2) and conclude that different age groups do not differently affect service quality. i.e. across all age groups perception of the service quality is same.

5.5.2 ANOVA between Service Quality as perceived by different Education Groups

H3o: There is no difference in the service quality offered by blood banks as perceived by the different education groups.

H3a: There is a difference in the service quality offered by blood banks as perceived by the different education groups.

ANOVA test proves that the difference between perceived service quality by different education groups is not statistically significant. This is indicated in Table-4.
It is clear from the results listed in Table-4 that the Null Hypothesis of No Difference is not rejected. We conclude that people of different education group have no different perception about the service quality offered by different blood banks.

5.5.3 ANOVA between Service Quality as perceived by different Occupation Groups

H4o: There is no difference in the service quality offered by blood banks as perceived by the different occupation groups

H4a: There is a difference in the service quality offered by blood banks as perceived by the different occupation groups.

ANOVA test proves that the difference between perceived service quality among different Occupation groups is not statistically significant. This is indicated in Table-4 again.

Results in Table-4 shows that we fail to reject Null Hypothesis of no difference and conclude that different occupation groups do not have different perception about the service quality offered by different blood banks.

5.5.4 ANOVA between Service Quality as perceived by different Gender Groups

H5o: There is no difference in the service quality offered by blood banks as perceived by the different gender groups

H5a: There is a difference in the service quality offered by blood banks as perceived by the different gender groups.

ANOVA test proves that the difference between perceived service quality by different age groups is not statistically significant. This is indicated in Table-4.

Outcome of the above in Table-4 shows that we fail to reject the Null Hypothesis of no difference and conclude that gender has no effect on the service quality of blood banks.

On one hand, there is BBP (Code-named), which is perceived to be the best among the four and on the other hand there is BBV (another) Blood Bank which is perceived to be offering low service quality. There is also significant difference in quality among any pair of blood banks chosen, excepting between BBG and BBR (another two blood banks).

This implies e.g., BBP is perceived to be significantly better than even the second best and BBV is perceived to be significantly worse than even the last but one bank. These have significance for all the banks. It is clear that, if BBP is taken as a benchmark, all remaining blood banks need to improve their quality. It is imperative that these other banks improve their equipment, and/or procedures, and /or Responsiveness to the customers and Empathy for the customers.

On the other hand, contrary to general perception, the study finds that if age-group wise comparison is made of the service quality, there is no difference between perceived gap among different age groups. That is, a person of any age has similar perception as a person of any other age. The same is true for Education, Occupation, and gender. Thus, the perception of service quality is uniformly similar among all demographics detail of respondents. This reinforces the conclusions drawn above. A good bank is perceived to be good by all irrespective of gender, age, occupation and education (Except Hypothesis No.1, all other four Hypotheses were rejected) i.e. a blood bank perceived to be not so good, is perceived to be not so good by all.

5.6 Dimensions of Service Quality in Blood Banks in India

The authors based on the pilot survey, literature, and research advocates the need of customizing the original SERVQUAL Scale before adopting in general. During pilot stage of the research a need of its modification was felt, which was further reinforced by, when the same was subjected to factor analysis. Factor analysis revealed seven dimensions of service quality namely Process, Tangibles, Reliability, Responsiveness, Assurance, Empathy, and Non-Verbal Communication. The scale, modified by us appears to be just appropriate. Together seven factors explain more than 65 % of variance, which signifies their correctness. Factor 1 (Process) consists of seven items and explain 12.98% variance in the service quality. Factor 2 (Tangibles)) consists of three items and explain 10.44% variance in the service quality. Factor 3 (Reliability) consists of three items and explain 9.11% variance in the service quality. Factor 4 (Responsiveness) consists of three items and explain 8.84% variance in the service quality. Factor 5 (Assurance) consists of three items and explain 8.34% variance in the service quality. Factor 6 (Empathy) consists of three items and explain 8.26% variance in the service quality. Factor 7 (Non-Verbal Communication) consists of three items and explain 7.64% variance in the service quality.

5.7 Benchmarking Best Practices

To identify the best practices, first it was verified whether the perceived scores of respondents on each dimension of service quality was significantly different across the blood banks studied. The weighted average of the respondent scores on each indicator for each factor was used for this purpose. As shown in Table-5 the perception scores were

found to be significantly different which made it meaningful to identify the best practices for benchmarking purposes.

Based on the above analysis, it is seen that BBG may be benchmarked for the process and the nonverbal dimension while BBP may be benchmarked for tangibility, reliability, responsiveness and assurance dimensions. On the empathy dimension, both BBG and BBP are found to be equally good and so both may be benchmarked.

To elaborate this further, BBG performs health checks to ensure worthiness of donors and also have a system to trace the donors once they have donated blood. They also keep a track of the medical history of their donors which helps them to decide whether a donor is eligible or not to donate blood. To quote an instance, one of their regular donors was not allowed to donate on one occasion after it was discovered from their medical history records that he had suffered a heart attack in the recent past. These practices are indicative of a professionally managed blood bank and may be used as benchmarks by other blood banks. The employees of this blood bank had a neat appearance and were also knowledgeable to answer questions of donors.

Table 5. Perception of Service Quality Dimensions across Blood Banks

Service Quality Dimensions	t-Value	DOF	Significance
Process	36.931	3	.000
Tangible	18.824	3	.000
Reliability	29.497	3	.000
Responsiveness	34.650	3	.000
Assurance	54.220	3	.000
Empathy	88.007	3	.000
Non Verbal Communication	35.485	3	.000

Based on the above analysis, it is seen that BBG may be benchmarked for the process and the nonverbal dimension while BBP may be benchmarked for tangibility, reliability, responsiveness and assurance dimensions. On the empathy dimension, both BBG and BBP are found to be equally good and so both may be benchmarked.

To elaborate this further, BBG performs health checks to ensure worthiness of donors and also have a system to trace the donors once they have donated blood. They also keep a track of the medical history of their donors which helps them to decide whether a donor is eligible or not to donate blood. To quote an instance, one of their regular donors was not allowed to donate on one occasion after it was discovered from their medical history records that he had suffered a heart attack in the recent past. These practices are indicative of a professionally managed blood bank and may be used as benchmarks by other blood banks. The employees of this blood bank had a neat appearance and were also knowledgeable to answer questions of donors.

BBP had visually appealing physical facilities as also modern looking equipment making them an ideal benchmark unit on the tangible dimensions. The same is true on the reliability dimension since they deliver reports to the donors in a timely manner and demonstrate a sincere interest in solving donor problems. Also, they can be benchmarked on the responsiveness dimension because of their prompt services and willingness to help. Other factors which can be benchmarked by the others include the assurance dimension since the behavior of the employees instill confidence and the blood bank also gives a feeling of safety to the donors.

Both BBG and BBP may be emulated on the empathy dimension since in both the blood banks the employees give personal attention and work with the best interest of the donors at heart.

6. Conclusion

The study, based on four blood banks in Ahmedabad (code named as BBG, BBR, BBV, and BBP), clearly establishes that there is difference in the service quality offered by blood banks. Of the four blood banks studied BBP is perceived to be the best among the four and BBV is perceived to be offering poor service quality.

It is also found in the studies that the perception of service quality is not affected by demographic factors. In other words the concerns of donors while donating blood are universal and are not specific to age, gender, occupation or education categories.

The study has also helped in identifying the best practices under the various service quality dimensions.

7. Managerial Implications of the Study

The study reveals interesting and significant findings which could be useful for policy making by the Blood Banks and by the Government.

The first managerial implication of the study is that, overall service quality is crucial to attract potential donors on a sustainable basis. Specifically the status of service quality in the blood banks currently operating needs to be improved.

The second managerial implication from the result of the study is the identification of specific operating practices for each dimension of service quality, which can be used for benchmarking and improvement in performance by the less professional blood bank.

The third managerial implication from the

study is that while implementation the marketing strategies segmenting the donors may not be necessary or effective since the perception of service quality is not affected by demographic factors like age, gender, occupation and education.

The fourth managerial implication of the study is that by improving the service quality among the existing players in the blood bank industry, it is possible to narrow the demand supply gap in the country.

The fifth managerial implication of the study is that because in India the supply lags the demand, it creates monopolistic situation and brings in the callous attitude among the blood bank providers, and they do not pay enough attention to the service quality aspect. This attitude further affect the donor's willingness to visit on a sustainable basis to donate blood.

The sixth managerial implication of the study is that as the number of donors increases through improved service quality, economy of scale would be achieved for the blood banks, resulting in reduced per unit production cost. This in turn could have a dual effect on the margins achieved by the blood banks as also on reduction in cost of blood to the recipients. However the later benefit would accrue to the recipients provided the blood banks pass on the improved benefits to the recipients. Since this may not happen automatically given the commercial motive of the blood banks this has important implications for the Government Policy. The Government can play a regulatory role in ensuring improved supply at reduced cost.

8. Contribution of the Study

Our study reinforces the belief that the blood quality should be of paramount importance, requiring healthy voluntary donors which in turn can be ensured through urgent measures to fill the gap vis-à-vis the best perceived bank. The study has identified best practices under different dimensions of service

quality, currently being practiced by the blood banks. These practices can be emulated by the other blood banks which are lagging behind on those parameters.

The research has identified vital issues which are of importance to the blood donors, blood banks in specific and to the society and the country as a whole. Research implication if addressed in right earnest has potential to solve the demand supply gap of the blood availability. In this respect delighting the customers (donors) is all the more important. When marketing management these days is talking of delighting the customers, the field of blood transfusion should not be left untouched. Blood banks should introspect and find out the ways of closing the gap in service expectations of blood donors. The research has identified the relevance of using the Gap model of measuring service quality in blood transfusion services.

8.1 Limitations and Future Scope

Limitations of the study include sample. Although 311 respondents have been included in the survey, but they all belong to one city only. Also we had included the donors of the blood and did not include receivers of the blood, which could also be the limitation of the study. Blood bank's perspective also was not included in the study. These are the limitations of the present research. Addressing these limitations will open future scope of research. Bank wise further analysis still required to be done to gain an access to the detail of the service quality.

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