



AVERTING MATERNAL DEATH AND DISABILITY

Stimulating policy debate on blood transfusion services through the work of an emergency obstetric care project in Nepal[☆]

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Abstract

Purpose: To improve the quality and accessibility of emergency obstetric care (EmOC) at district level. *Methods:* As the availability of safe and reliable blood transfusion services is a critical component of EmOC, financial and management support was provided to the blood transfusion service centers in the 3 project's Phase 1 districts. *Evaluation:* An evaluation after 3 years showed that, with modest financial outlays and the development of supportive district level partnerships, substantial improvements in quality and management of services had been achieved. The evaluation also identified limitations imposed by lack of legal frameworks and central support; although the Nepal Red Cross Society has a government mandate to supply the national blood needs, the operating procedures and guidelines have no legal base. The evaluation report was widely circulated, and the findings used in national policy discussions. *Results:* Following this a task force was commissioned to develop a legal policy framework to ensure standardized quality blood services with defined management and monitoring roles and responsibilities.

[☆] The views expressed herein are solely those of the authors and do not reflect those of DFID or NSMP.

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1. Introduction

The Nepal Safer Motherhood Project (NSMP) had an important role in stimulating policy level debate about blood transfusion services in Nepal. The project contributed to a more informed process of institutional development and improvements to national services. The paper outlines how NSMP, in providing support for the development of improved emergency obstetric care (EmOC) services in selected districts, addressed the need for more reliable blood transfusion services at national level. The achievements and challenges are documented to provide a resource for other countries needing to address similar issues.

2. Background and history

2.1. In 1966

The Nepal Red Cross Society (NRCS) established the first blood transfusion center in Nepal, in Kathmandu, supplying 157 units of blood in the first year. The Australian Red Cross provided initial support and services were gradually expanded.

2.2. In 1983

The Central Executive Committee of the NRCS, including representatives from the Ministry of Health (MoH), drafted the NRCS Blood Transfusion Service Regulations, to serve as a framework for management and administration of national services, and set guidelines for minimum standards. Management committees at 3 levels (national, regional and district) were stipulated, and recommended procedures for collection, storage and supply of blood were outlined. However, these are internal NRCS regulations with no legal authority.

2.3. In 1991

Twenty-five years after services began, the NRCS was designated by the government as the sole agency responsible for the management of blood transfusion services in the country, including: the

collection, testing/screening, storage and supply of blood to hospitals; granting permission to public and private hospitals to manage their own services; and monitoring standards. The policy specified that the NRCS should strive to ensure universal provision of adequate safe blood and blood products at reasonable charges, irrespective of caste, creed, religion, gender and nationality, and collect blood only from healthy unpaid voluntary donors. The sale or purchase of blood was prohibited.

2.4. In 1998

The NRCS developed Standard Operating Procedures (SOP), based on the 1983 regulations, covering: management systems (constitution and responsibilities of blood bank management committees at national, regional and district levels); laboratory services; blood collection and supply systems; and staffing. Specific guidelines were provided for district chapters in: donor motivation; mobile blood collection procedures; storage; prevention of hazards; laboratory procedures (grouping and serological tests, including HIV, Hepatitis C Virus (HCV), Hepatitis B (HbsAg) and Venereal Disease Research Laboratory (VDRL)), blood component production, cross-matching and supply procedures; and internal information procedures. These provided the foundation on which a 12-month Assistant Blood Technician training was based. The SOP was submitted to MoH for approval, but never processed, and thus has no legal standing.

Table 1 Blood transfusion service centers in Nepal

Types/levels of BTSCs	Number	Coverage
Central BTSC	1	Kathmandu
Regional BTSCs	3	Kathmandu, Biratnagar, Pokhara
District BTSCs	20	
Emergency BTSCs ^a	15	14 districts
Hospital units	15	9 in Kathmandu valley; 6 in districts

^a Emergency BTSCs have no storage facilities, but keep a list of donors who can be called upon to donate blood in an emergency. They provide basic cross matching and testing services only.

3. The situation today

3.1. Management

The NRCS currently operates 54 Blood Transfusion Service Centers (BTSC), in 39 of the 75 districts of Nepal [1], as shown in Table 1.

Management of the service is intended to function at 3 levels.

3.1.1. Central

The Central Blood Transfusion Service Center (CBTSC) in Kathmandu is responsible for management of services in the Kathmandu valley, and for supervising and monitoring the technical standards of the district centers, providing guidance to ensure the collection and supply of safe blood.

3.1.2. Regional

Although three of the five regions have centers, these provide local services only, thus there is no functioning management structure at the regional level.

3.1.3. District

The district BTSCs are managed by NRCS district chapters. Although these are supposed to comply with guidelines provided under the 1983 NRCS regulations and the 1998 SOPs, in reality they operate independently, each setting up their own systems and charges. They receive no government funding, but some support in procurement of supplies is provided by the CBTSC.

3.2. Supply and demand

Despite the lack of a legal framework, Nepal provides a model for the region in the successful development of a blood donor recruitment (i.e. voluntary and replenishment by patient relatives) program. Unlike most South Asian countries, commercial blood donation is not commonly practiced, and blood services operate through voluntary unpaid donation. In contrast, in Bangladesh, paid “professional” donors supply approximately half of the national blood requirements, compromising the capacity to provide safe blood [2]. Even in India, despite prohibition in 1998, following the verdict of the Supreme Court on a petition filed against the Union of India and the Indian Red Cross [3], it is estimated that around 25% of blood supplies still come from paid donors.

In the Kathmandu valley, where 39% of blood collected nationwide is used, NRCS data show that since 1999, an impressive 92% of all blood has

been supplied through voluntary donation [4], largely as a result of NRCS donation campaigns. However, in most rural districts, despite the active campaigning of numerous social organizations and political parties, the estimated figures are much lower (detailed data are not available), and blood collected through voluntary donation is not sufficient to meet demand. Thus in most districts, in emergencies the patient’s family is usually expected to arrange “replacement blood”, i.e. donation, either by a family member or friend or other willing volunteer.

4. The Nepal Safer Motherhood Project (NSMP)

Nepal has a high maternal mortality ratio. The government figure is 539 per 100,000 live births [5], whilst the UN estimate is 740 (range 440–1100) [6] and maternal death is the leading cause of death (20%) among women of reproductive age. Although advances have been made in other areas of health in Nepal, for example child mortality has declined rapidly since the early 1980s [7], and contraceptive use has increased by 35% over the last 5 years [7], progress in reducing maternal mortality has been slow, with little change in practices related to care during childbirth. Around 90% of births take place at home, with only 13% of all births attended by a health professional, and clean delivery kits used in only 9% of cases. Only 14% of pregnant women make the recommended four antenatal care (ANC) visits, and four of five women who give birth at home receive no postnatal care [7].

It is estimated that 15% of all births will develop complications requiring emergency care and referral to a higher center [8]. Some of these will require blood transfusions, as 62% of maternal deaths in Nepal occurring within seven days of giving birth are due to postpartum hemorrhage [9]. The availability of 24-h EmOC services in most of Nepal is inadequate, as highlighted by an assessment carried out in three of the five regions of the country [10], which revealed that for a total population of 12.7 million, there are only 18 comprehensive EmOC and 5 basic EmOC functioning sites, compared with a UN recommendation for 26 comprehensive and 102 basic sites. This lack of available services, coupled with under-utilization of existing services results in high un-met need for EmOC of 95% [10].

NSMP, funded by the Department for International Development (DfId) and managed by Options/UK, was established in 1997, as a partner

in the national safe motherhood program, also launched in 1997. NSMP was one of the first large-scale international projects to focus on supporting access to EmOC, and to acknowledge the critical role of blood transfusion services. From 1997 to 2000 (Phase 1) NSMP supported the three districts discussed in this paper, and from 2000 (Phase 2) a further six districts were added (representing in total 13% of Nepal's population). Learning from 6 years of implementation, and work at national policy and program level, has helped to place EmOC at the heart of the national safe motherhood program, as reflected in the National Safe Motherhood Plan (2002 to 2017).

In 1997 NSMP evaluated blood transfusion services in the 3 initial project districts (Baglung, Surkhet and Kailali), as a component of a participatory in-depth EmOC needs assessment [11]. This highlights a critical lack of reliable safe blood transfusion services, providing valuable information on the realities at district level. NSMP began supporting the development of EmOC services in these 3 districts in 1998, addressing both improved quality of services and increased access and demand. Linked with this, support was provided for improvement of blood transfusion services in these districts.

5. NSMP support for blood transfusion services

The needs assessment showed that the 3 districts were not consistent in their screening and blood testing practices, and quality of services could not be assured. Only one district screened for HIV and Hepatitis B, none provided quick tests in the event of obstetric emergency, and none performed the HCV test. There appeared to be no awareness of the implications of poor testing practices. Four major problems were identified:

1. Lack of reagents for recommended tests.
2. Failure to adhere to protocols.
3. Poor handling practices (not wearing gloves, inadequate labeling).
4. Poor infection prevention (IP) practices.

The strategy developed by NSMP for providing project support to the district BTSCs addressed material, human resource and management issues, with the aim of assisting the NRCS district chapters to develop self-sustaining, affordable, safe services. Since the 3 district BTSCs were established at different times (1987, 1994 and 1995), they dif-

fered considerably in their stages of development and practices.

5.1. Material support

NSMP provided a total of US\$1700 to the 3 BTSCs for purchase of a 4-month "start-up" supply of reagents and supplies for testing. This included quick tests for HIV and Hepatitis B, and the required tests (Antiserum and Coomb tests) for cross matching, VDRL, blood bags and transfusion sets. The aim was to enable the centers to routinely carry out all the recommended tests, and to clear outstanding invoices and establish a revolving fund to maintain supplies for the future. In 2002, when CBTSC directed all NRCS district centers to carry out HCV tests on all blood, NSMP provided a year's supply of HCV quick tests (at a cost of US\$2293) as one time support.

NSMP also provided equipment (at a total cost of US\$7145) to the 3 BTSCs, including refrigerators, autoclaves, test tubes, serological water baths, hot air ovens and incubators, water distillation plants and blood bag sealers.

To address the lack of funding for district BTSCs, NSMP supported income generation schemes to provide sustainable financing. These were implemented in partnership with the BTSCs, and differed according to the local situation. In Kailali district, US\$3268 was provided for the purchase of a photocopier, and in Surkhet, US\$4054 was provided to finance the construction of a warehouse and small shopping complex for renting out. No input was required for Baglung, since sufficient income was already available from the higher charges levied for blood, and rent from local medical shops.

5.2. Human resources

The needs assessment revealed a serious shortage of trained staff, with only one of the 3 districts employing two technicians (to ensure 24-h cover), and the other two operated by one technician only. This was coupled with inadequate skill levels, even among those who received training. NSMP supported the training of four additional technicians through the 12-month NRCS blood technician course, and the provision of NRCS refresher training for 3 of the existing technicians. The technicians were also included in the NSMP whole-hospital training for medical equipment users.

NSMP provided training for members of the 3 district NRCS chapters and local NGOs to enhance their skills in motivating potential blood donors, including explanation about the importance of

donating blood, and counteracting rumors of adverse health effects.

5.3. Management support

Through the continuous district presence and activities of project staff (one experienced nurse was provided for each district), NSMP facilitated the development of an enabling environment for BTSC staff, fostering improved relationships and understanding between the BTSCs and hospitals. In particular, technical advice was provided on the establishment of exemption schemes for the poor.

6. Findings from evaluation of the blood transfusion service: 2001

In 2001, after providing 3 years of support to district BTSCs, and in response to feedback from locally based staff that blood services were still not fully meeting local needs, NSMP commissioned a performance evaluation [12] in the 3 project districts, the first in the 35-year history of blood transfusion services in Nepal. An early key finding was that, despite NSMP inputs, district performance remained greatly dependent on national level policy issues and the standards set by the Central BTSC. The scope of the evaluation was therefore expanded to cover national policies and standards, through central level interviews and meetings, and a literature review. The findings are summarized as follows.

6.1. Standardization

The evaluation confirmed that without government policies and support, the ability of the CBTSC to provide technical supervision was extremely limited, and in fact no meaningful national blood transfusion standards were in force. The 53 district BTSCs appeared to operate independently and maintain different standards in every respect. Although significant improvements were noted in the project districts (some showing more progress than others), there was a need for national and district level institutional inputs to ensure standardized and sustainable services.

6.2. Quality assurance

Despite improvements in the project districts, it was found that the effectiveness of blood services was compromised by a lack of coordination and communication between hospitals and district NRCS chapters, and lack of mechanisms for provision of

supplies for blood banks through the CBTSC. Physical facilities were in poor condition, due to insufficient attention to regular maintenance of buildings and equipment. NSMP input had improved care of equipment by introducing techniques for minimizing equipment damage during usage, but the larger issues of building maintenance and equipment servicing remained a problem, and spare standby equipment was often not available. This lack of appropriate equipment, combined with the lack of national mandatory test protocols and guidelines, resulted in low quality laboratory procedures. Waste disposal systems were completely unsatisfactory, and infection prevention practices needed improvement. The overall conclusion was that the national blood transfusion system did not ensure the provision of safe blood, even in the NSMP supported districts, although significant improvements were noted since the needs assessment in 1997.

Screening for HIV was introduced in 1992. The HIV rate in 2002/2003 among blood donors was 0.4% which corresponds to the national HIV infection rate for adults of 0.5% [13].

6.3. Management of supplies

Poor management and mismatching between collection rates and demand for common blood groups regularly leads to shortages, and conversely stored blood sometimes goes beyond its expiry date, because too much of the less needed blood groups is collected. Reliable district data on voluntary donation and replacement is not available for all areas of the country, but the 3 project districts are estimated to meet around 80% of the needs through voluntary donation, reflecting a considerable increase since NSMP support began (see Section 7). In the remaining 39 districts where services exist, poor quality and non-standardized record keeping makes it impossible to assess the extent to which the blood demands of hospitals are met by available supply. In the 36 districts where there are no services, many lives are lost through lack of blood.

The current armed conflict means that the unmet need is becoming more acute, particularly in the heavily affected poorer, remote western districts, which are the ones lacking services.

6.4. Charges

The lack of national standard charges and exemption policies means there is no formal basis for determining service charges at district level. The local Red Cross chapters said that charges are set on the basis of cost recovery, which is dependent on the local

context (with cities being cheaper and hill areas more expensive), but with a price range of US\$4.50 to US\$10 per unit (350 ml bag), it appears that revenue is not being effectively utilized to support services. Lack of cost analysis skills and failure to develop systems for curtailing unnecessary costs, or ensuring that revenue is not used for other purposes results in excessively high service charges, so that users bear the costs of service inefficiency.

6.5. Human resources

The blood transfusion technicians employed by most district chapters receive the 12-month NRCS training. However, the course has not received MoH validation, and a national evaluation found that the curriculum is inadequate, and technicians have no protection from legal action in the event of transfusion-related complications. The laboratory assistants, who are employed in smaller numbers, and are trained under the Council for Technical Education and Vocational Training (CTEVT) affiliated courses, were found to have a better knowledge of laboratory procedures, but they require additional training in the specialist aspects of providing blood services. The evaluation also found that retention of these more highly qualified staff is because of poor incentives, long duty hours (without overtime pay), and lack of professional development opportunities.

6.6. Supplies

The CBTSC is responsible for bulk procurement and delivery of all supplies. However, as many districts fail to pay bills on time, supplies are often disrupted, as the CBTSC is unable to continue procurement without payment of outstanding bills. The evaluation found that many district chapters buy supplies from the Indian market or from Kathmandu, buying smaller quantities to satisfy immediate needs, and thus prices paid are variable. Such ad hoc practices mean that services are often hindered by lack of reagents and kits.

6.7. Solutions sought

The evaluation identified 3 key issues to be addressed:

- Clear definition of the roles and responsibilities of government, NRCS and district chapters.
- Increased technical capacity at central level to support district services.

- Standardization and improved quality of services, through the development of protocols and appropriate training and career structure for technicians.

7. Outcomes of NSMP support in the 3 project districts

Despite continuing shortcomings, the evaluation found that considerable progress had been made in the 3 NSMP supported districts, suggesting that much can be achieved, even in an unstructured context with little or no national level support.

7.1. District level

The financial support provided by NSMP to the 3 NRCS district chapters was relatively small (US\$31,450 in total). However, appropriate timing of well-coordinated incremental inputs, combined with technical and management support, and establishment of supportive relationships between NSMP, local health staff and NRCS staff and members maximized the impact of this investment, resulting in positive changes.

7.1.1. Improved management and finance

The revenue from the NSMP initiated income generating schemes, combined with the clearance of outstanding debts through the provision of the 4-month start-up supply of reagents, enabled the 3 district centers to set up revolving funds to cover staffing and general running costs, including replenishment of reagents and kits. Using the funds and income from fees charged for blood, the BTSCs now have a sound financial base, and are self-sustaining, although the extent of the success varies between the 3 districts, for example, only one has established a separate bank account for blood transfusion services, to ensure that funds are not mixed with those of other NRCS activities. Most importantly, the BTSCs in all 3 districts are now able to provide blood at no charge for the poorest clients. The income deficit is met either by the BTSCs, or is sometimes reimbursed by the Hospital Committees and/or the local government.

The additional staffing provided with NSMP support has reduced the duty periods of technicians, enabling the BTSCs to provide 24-h services and keep administration work up to date.

7.1.2. Increased availability of blood supplies

During the period of NSMP input, the availability of blood supplies in the 3 districts has increased markedly, as shown by the figures in [Table 2](#).

Table 2 Blood supplies available in NSMP supported districts (units given)

Year	Baglung district	Surkhet district	Kailali district
1998	79	131	505
1999	81	159	643
2000	262	239	811
2001	297	477	1005
2002	342	510	1036
2003	133 ^a	620	1314

^a For Baglung the 2003 figure is lower than that for 2002, reversing the upward previous trend. This is due to a combination of circumstances, including a worsening of the armed conflict in the Baglung area, which makes it more difficult for people from remote areas to travel to the hospital, and recent staff and management changes.

As a result of NSMP training, the district chapters have organized more effective blood donation camps, thus contributing to the increased blood supply (see Table 2). The BTSCs keep a list of donors who can be called upon at any time, including those with rare blood groups. Replacement of blood by relatives is no longer compulsory, although wherever possible relatives are requested to replace blood used for a patient.

The evaluation reported that at least 50% of the total blood supplied was used for obstetric emergencies, and was as high as 80% in one of the districts. Thus the increased availability of blood contributes to saving maternal lives.

7.1.3. Improved quality assurance

The provision of a start-up supply of the reagents required for all recommended tests has resulted in a more standardized testing and safer blood supplies. A system has been set up for compulsory testing of all samples for HIV, HCV and HbsAg.

The inclusion of blood technicians in the NSMP whole hospital training resulted in improved IP practices, contributing to improved safety of blood supplies. Maintenance and overall condition of NRCS equipment has been substantially improved by the inclusion of blood technicians in hospital medical equipment users training.

7.1.4. Partnership approach

The enabling environment generated through the efforts of NSMP staff, and consequent improvement in local level relationships and understanding, has led to the establishment of a working partnership between the NRCS, the community and the local hospital. Although the modalities and extent of partnership arrangements differ slightly between the districts, in all 3 cases improvements in district level planning have been observed. Based on the

learning and positive feedback from experiences in the 3 Phase 1 districts, a joint planning workshop was organized when project support started for 2 of the Phase 2 districts (Jumla and Dailekh), where there were no blood transfusion services. The decision was made to form a partnership between NRCS, the hospital and community, and participatory planning initiated.

7.1.5. Scaling up

The learning gained from the 3 Phase 1 districts has enabled NSMP to more effectively plan and implement support in 6 new Phase 2 districts. The UNICEF Women's Right to Life and Health project provides support to blood services in four districts, and has drawn heavily on the NSMP experiences.

7.2. National level

The 2001 evaluation showed that many strategic issues related to local blood transfusion service supplies require policy level decisions. The most critical issue was that, while responsibility for services lies with the NRCS, the roles of the NRCS and the MoH are not clearly defined. The evaluation recommended a structured collaborative partnership between the two bodies for effective management of the national blood transfusion program.

Within this framework the following issues need to be addressed urgently:

- Development of national blood transfusion standards.
- Development of national standardized test protocols.
- Guidelines for operation and management of BTSCs.
- Development of a standardized national training curriculum for blood technicians.

NSMP circulated the evaluation report widely among senior officials of the MoH (including the division responsible for addressing HIV/AIDS), the NRCS and bi-lateral and multilateral donor agencies, particularly the World Health Organization (WHO) and UNICEF. Several meetings and one major workshop (initiated by the HIV/AIDS division of the Department of Health Services (DoHS) were held, to advocate for policy dialogue and discuss strategies. As a result of this process, in which NSMP participated actively, the profile of this essential service was raised and progress has been made. Recent developments include:

- Senior officials in the MoH and international development agencies accepted the need to

address blood transfusion services in health sector development planning discussions.

- At a joint workshop organized by the HIV/AIDS division, which included MoH officials, WHO and NRCS staff, the development of a national blood policy was recommended, as was improvement of the quality of technician training.
- WHO commissioned a situation analysis of the service in November 2002, which drew heavily upon and validated the NSMP 2001 evaluation findings.

The need for safe blood was addressed in the national HIV/AIDS policy of Nepal, 2002. The strategy reinforced the need for a national legal and policy framework for safe blood transfusion and organ transplantation, and for operational guidelines on the safety of blood and blood products. It went further in advocating for the establishment of a quality control and assurance system under the MoH, and a policy for the rational use of blood products when appropriate, rather than always using whole blood.

In December 2003, following a meeting of the MoH, NRCS, UNICEF and NSMP, chaired by the Director General of the DoHS, a task force was formed to review existing documentation and develop a policy framework addressing quality assurance, legal requirements and policies (including definition of roles and responsibilities).

8. Discussion

Five key learning points emerge from the NSMP experiences in supporting district blood transfusion services.

8.1. Need for a national level framework

A framework of national policies and regulations is vital to ensure the provision of quality blood transfusion services throughout the country. These must be enforced, and combined with effective technical and management support, which sets standards and ensures availability of resources. The experience of NSMP shows that the work of a district-based project can provide valuable stimulus and input to national level debate and advocacy, generating the involvement of a wide range of stakeholders, including development agencies, civil society and government.

8.2. Importance of public awareness

A ready supply of willing donors requires awareness-raising to promote public understanding of the need for safe blood supplies and the role of individual citizens. This is particularly important in avoiding a situation whereby the supply of blood becomes commercialized.

8.3. Effectiveness of a partnership approach

At the local level all stakeholders need to be involved in the process of developing and managing effective local services that ensure a reliable, cost effective supply of safe blood. These should include the local hospital, NGOs (especially the NRCS district chapter), local government, community organizations and community members, all of whom need to recognize that the maintenance of an effective and efficient blood supply is their joint responsibility. The participatory development of an effective partnership model, with clearly defined and understood roles and responsibilities, is critical to ensuring local ownership and sustainability of the service. Project input needs to be based on collaboration with local hospitals and managers of transfusion services, beginning with support for the generation of a clear vision and strategy for improving services, and ensuring transparency about project inputs throughout the process.

8.4. Financial inputs required

The financial support required to establish effective district blood transfusion services is not large, but must be combined with comprehensive management and technical support, in order to develop local capacity to plan, cost and monitor services.

8.5. Using an issue base

Although blood transfusion services should be available for all emergencies, focusing on a specific issue, such as EmOC, provides a convenient vehicle for illustrating the importance of the wider issue of blood supply, grounding ideas in reality and drawing other agencies into the work.

Sharing district level experiences with other safe motherhood stakeholders through the Safe Motherhood SubCommittee and other national level fora, and disseminating the evaluation report widely, contributed to significant changes in thinking around EmOC service support and development.

Considerable interest was stimulated in blood transfusion services, a hitherto under-valued and poorly understood area of EmOC, highlighting the extent of the links between EmOC and blood transfusion services, and the potential for significant impact on maternal mortality rates through improved blood services. Although much remains to be done, the importance of quality blood transfusion services has now been acknowledged in Nepal, and the need for sound national policies and the implementation of a standardized approach is being addressed.

9. Conclusion

This paper highlights two key points: First, that it is possible at a district level for a modest range of integrated inputs from an EmOC project to produce significant improvements in local blood services. However the effectiveness and sustainability of these is heavily dependent on the availability of national level policies and technical support. Second, a single, focused project can significantly influence national level policy development, through the acquisition of a body of relevant empirical knowledge and experience based on implementation experiences. These can be a powerful aid to advocacy efforts.

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