A blood-result turn-around time survey to improve congenital syphilis prevention in a rural area

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The results of a turn-around time study of blood specimens for syphilis serology in antenatal clinic attenders between 19 rural clinics and their base hospital, including a follow-up survey to assess the impact of interventions, are described. The objective of the study was to determine how long blood samples took to get from the clinic to the laboratory and back again. The time between each phase was recorded by inclusion of a dating system on the documentation that routinely accompanies the blood samples. The longest delay was the time at the laboratory. The results were reported to the various sectors involved in the handling of the blood samples. The solution was to make all divisions of the health service aware of the needs of the clinic staff and clinic service users, and to change laboratory routine.

S Afr Med J 1996; **86:** 67-71.

Management of health services, with the aim of improving health care, is a challenge to any health administrator. Managerial weakness at the local level has been cited as one of the reasons for poor functioning in some rural health care services.[1] Inertia in the health service and resistance to change on the part of individuals are common problems. Health workers who have done research into health service evaluation have emphasised the need to define objectives of a particular health service and then to evaluate whether these objectives have been met and the use of epidemiology in health service management and planning has been discussed in the literature.[2-5] While there is currently much work on policy development, the majority of health service managers operate at a much lower level. Their concerns are more mundane but as important to effective and efficient health service delivery. Measurement of outcome change is seldom quick and, in addition, a multiplicity of factors usually contributes to the change seen.[6] A systems approach to management has drawn our attention to the need to look at process as well as outcome in health service research.[7] Against this background, the apparently poor identification of pregnant women with positive syphilis serological tests in a rural area of South Africa was investigated.

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A simple turn-around time study was undertaken to attempt to define realistic objectives with regard to the determination of syphilis serology in antenatal patients attending rural clinics in the Nkomazi Health Ward. The study was undertaken to identify factors within the service that could be modified with a minimum of change, in a manner that would not antagonise any party and would require little extra work on the part of health service staff.

Congenital syphilis has been reported to be a significant cause of perinatal mortality. Two major referral hospitals in Soweto and Durban have reported that up to 10% of stillbirths and 3% of neonatal deaths are due to congenital syphilis.[8] Failure to prevent congenital syphilis through antenatal screening and treatment has been isolated as an important cause of preventable perinatal death.[9] Positive maternal serological tests in confirmed congenital syphilis cases have been found to be common. Seventy-eight per cent of the confirmed congenital syphilis cases in a Mozambican series were shown to have positive antenatal maternal syphilis serology, indicating that the majority of cases reported in this series could have been prevented by appropriate and timeous action in the antenatal period.[10]

The figures from the national HIV survey during October/November 1991 indicate that the prevalence of positive syphilis serology in antenatal clinic attenders in South Africa as a whole is 6.6% and 7.7% for Kangwane.[11] These are comparable with the results from a study in Natal where a positive syphilis serology prevalence rate of 7.6% was reported,[12] but are higher than the 0.15% reported from Amsterdam.[14] What is interesting about the Dutch report is that even at the low prevalence rate reported they found their screening programme to be cost-effective.

Reasons for non-treatment in the face of positive serological tests for syphilis include problems in health service provision and health service use. Influencing health service usage is a long-term process and requires substantial input to make health services more accessible, affordable and acceptable to users. There are already a number of women who do get antenatal care but who are not adequately screened and/or treated for syphilis.[8] There is therefore a need to look at modifications of existing health service provision to improve congenital syphilis prevention. The logistics of running an antenatal service where results are available timeously, rather than blaming service users for poor attendance, have recently also been highlighted in the literature.[15]

Nkomazi Health Ward

Nkomazi Health Ward is located in the Eastern Transvaal. The base hospital, Shongwe Hospital, is in the south-western area. There are 19 fixed clinics within the region: the nearest clinic is 5 km away from the hospital while the furthest is 70 km away. The clinics are in radio contact with the hospital 24 hours a day. Physical communication between the clinics and the hospital takes place via the clinic supervisors, the ambulance service, administration staff, the care group motivators (lay health workers) who run care groups at a number of clinics and the sisters running psychiatric and chronic diseases services. The hospital has a relatively sophisticated laboratory service with numerous well-qualified and trained full-time staff.

Antenatal services are provided at all the clinics. A routine first antenatal visit includes the taking of blood specimens for syphilis serological testing. These blood specimens are collected from the clinics and taken to the laboratory at Shongwe where a non-treponemal rapid plasma reagin test (RPR) is performed. A confirmatory treponemal haemagglutination test (TPHA) is performed on those with a raised RPR titre. The results are then recorded on the laboratory sheets and returned to the clinics. The RPR is not specific for syphilis and false-positive reactions may occur. The rate of false-positive results may be higher in pregnancy. For diagnostic purposes, confirmation is required by the more specific TPHA test.

Of the women in Kangwane interviewed in an HSRC survey, 96% had received some form of antenatal care.[16] However, it was found that the vast majority of women attending Kangwane clinics did so after the 24th week of pregnancy.[17] Ten per cent of women were found to have made only one antenatal clinic visit prior to delivery. Most women attend antenatal care for the first time when they are between 28 and 32 weeks pregnant. According to the nursing protocol, these women are asked to return for a second visit in 2 weeks time. Ninety per cent of attenders therefore do so often enough to have a positive syphilis result treated if the results are returned within 13 days. However, a clinic review found that the time taken for blood results to reach the clinics and the relatively late booking of pregnant women meant that confirmed syphilis was not always treated.[17] Clinic staff also identified the slow turn-around time of blood results as the main reason for their not being able to treat women with positive syphilis serology.

There are a number of stages at which delays could occur: during collection of blood samples from the clinic, during delivery of blood to the laboratory, delay within the laboratory, delay in the return of the results to the community health department from where they are distributed, or delay in the return of the results to the clinics.

Objectives

The objectives of this study were: (*i*) to document the turn-around time of blood specimens from the antenatal clinics and to determine if and where delays occur; (*ii*) to communicate these findings to the staff involved and to agree jointly on mechanisms for improvements; (*iii*) to assess if consequent changes had had any effect on the number of antenatal clinic attenders with syphilis serology recorded.

Material and methods

All blood specimens from antenatal care patients who attended any of the nineteen fixed clinics in the Nkomazi Health Ward during an 8-week period in 1991 were included in the study. Before the study all current antenatal records at the clinics were reviewed and the number of patients with

syphilis serology results recorded were noted. All patients attending an antenatal clinic have their details recorded on a single sheet that accompanies the blood samples taken at that clinic. A column is left empty for the results, which are filled in by the laboratory staff, and the same form is then returned to the clinic. These forms were stamped with a simple rubber stamp made for the study so that the date of blood-taking, the date of collection from the clinics, the date of arrival at the laboratory, and date on which results were ready, the date on which the results were fetched from the laboratory and the date the results were returned to the clinic could be recorded. From this form, data on the interval between each stage of the process could be recorded.

All relevant staff were instructed by the author on how to fill in the forms and requested to fill them in as indicated. In the first week of the study, the author visited each clinic and the laboratory to ensure that the system was understood and that staff were filling in the forms as required. The system was then left to run for an 8-week period. Thereafter, the author again visited each clinic and collected the data from the syphilis serology result forms filed at the clinics. Simultaneously, the recording of the results on the patients' cards and the treatment of positive patients were checked.

All data were entered into Epi-Info on a personal computer. The time taken for each stage of the process was calculated; differences between the subregions and clinics were investigated.

A report-back meeting was held with relevant staff where results were presented and changes to the system discussed and agreed to.

Two months after the results of the survey had been made known and changes in the system had been implemented, each clinic was visited and the current antenatal care records were again reviewed to record the number of patients who had syphilis serology results recorded. Five months later a sample of clinics (12/19, selected on the basis of available transport on that particular day) were revisited and recording of syphilis serology on antenatal care cards was again reviewed. The dates and times of both sets of visits were not made known to the clinic staff.

Results

Data on 220 batches of blood samples were collected; 30% of these had to be excluded from some part of the analysis due to one or more of the dates not being filled in. The number of days (mean and range) for each part of the process is presented in Table I. In 41% of the batches of specimens followed it took 13 days or less from the time of bloodletting to the time that the results were back at the clinic.

The percentage of total time that the specimens spent at each stage of the process is shown in Fig. 1. The longest period, 47% of the time, was spent within the laboratory. Fourteen per cent of the time was taken up in getting the results from the laboratory to the Department of Community Health for distribution to the clinics, and 23% of the time was taken up in returning results to the clinic.

Within the laboratory, 66% of the batches in the survey were ready within 7 days. However, 33% took between 8 and 28 days; the average was 13 days.

There was no consistent relationship between distance from the hospital and overall turn-around time.

Table I. Number of days taken for blood specimens to reach the hospital and results to be returned to the clinics in Nkomazi Health Ward

Stage of process and interval between	Mean	Range
Blood being taken and collection from clinic	1.5	0 - 16
Collection from clinic and arrival in lab.	0.9	0 - 12
Arrival in lab. and collection from lab.	6.8	0 - 28
Collection from lab. and arrival at Community Health Dept	1.6	0 - 14
Collection from Community Health Dept and arrival in clinics	3.3	1 - 14
Total	15	2 - 43

0 indicates that the specimens arrived on the same day.

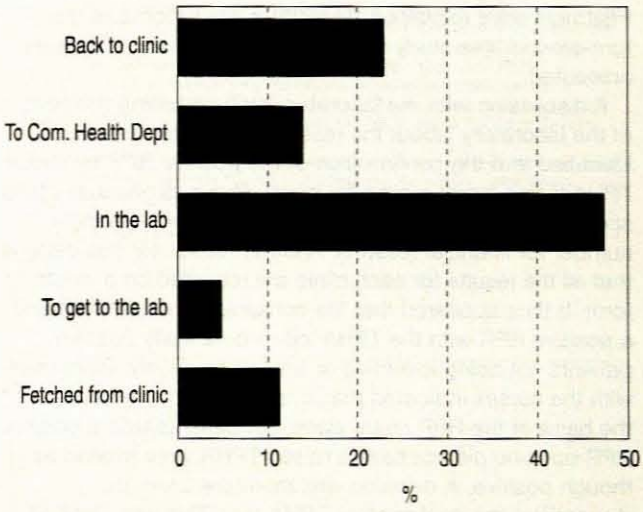

Fig. 1. Percentage of total time spent in each stage of handling.

Discussion

As can be seen from Table I, there is a large range in the times taken for specimens to reach their destination. Specimens are, however, usually collected on the day that the blood is drawn from the antenatal patients and are usually delivered to the laboratory on the same day or within 1 day. Both of these time periods are acceptable and do not appear to need improvement. The longest time spent at any stage is in the laboratory. While this is appropriate, the length of time appears to be too long to enable specimens to be returned to the clinics within 13 days. It is clear that the laboratory can and did process blood samples within 1 day; however, this level of efficiency cannot realistically be expected routinely, given the demands on the laboratory. The frequency distribution of time taken for blood specimens in the laboratory indicates that one-third took an average of 13 days and these were more likely to be those batches which included positive syphilis serology results as

they required further TPHA testing. The time taken for blood results to get from the laboratory to the Department of Community Health for distribution to the clinics is on average 1½ days. The department is within the hospital and the results could therefore realistically be expected to reach the department on the day they are ready. While it took, on average, 1½ days for blood to get from the clinics to the hospital, the average time taken for the results to get from the hospital back to the clinics was 3½ days. Time-saving methods in the laboratory, in the hospital administration and in the returning of results to the clinics therefore needed to be identified.

Once problem areas were identified by the author, a group of appropriate people who could impact on the problem were identified. Two report-back meetings were held. Results were presented to the clinic staff at their monthly in-service training meeting. Hospital staff, including laboratory staff, drivers of the various vehicles that go to the clinics, both clinical and administrative, and the hospital messengers were invited to a second presentation of the results. At this meeting the meaning of the syphilis test, the consequences of non-treatment and the method of treatment were explained. Thereafter, the process of the turn-around time study was explained and the results were presented.

A discussion with the laboratory staff, including the head of the laboratory, about the reason for laboratory delay identified that the confirmation of the positive RPR by repeat TPHA was a major reason for delay. This was because blood specimens were tested in batches of a certain minimum number for financial reasons. Another reason for this delay is that all the results for each clinic are recorded on a single form. It thus appeared that the consequences of confirming a positive RPR with the TPHA led to potentially positive patients not being identified or treated timeously. Discussion with the nurses indicated that, in practice, they treated on the basis of the RPR result alone, i.e. patients with a positive RPR but who did not have a raised TPHA were treated as though positive. A decision was therefore taken to discontinue the confirmatory TPHA test. This was justified on the basis that penicillin is a very safe drug and that administration thereof was the *de facto* practice. Reports of the prevalence of serious anaphylactic reaction to penicillin range from 1.5 to 4 per 10 000.[18] Assuming an RPR false-positive rate of 0.03% and a prevalence of RPR positivity of 10% and using the higher anaphylaxis estimate of 4/10 000, it is likely that 1.3/100 000 women screened would develop an unnecessary serious anaphylactic reaction to penicillin. Statistics from the Nkomazi Health Ward indicate that about 6 000 women attend antenatal care per year. The discontinuation of the TPHA confirmation test could therefore result in 1.3 cases of preventable anaphylaxis every 16 years. This appears to be a reasonable risk, compared with prevention of perinatal death or congenital syphilis in a proportion of the approximately 462 RPR-positive pregnant women who are identified annually in this region.

Laboratory staff also indicated that priority was given to investigations for hospital patients as hospital doctors wanted their results immediately. Once the importance of the preventive aspect of syphilis serology had been emphasised, the laboratory staff agreed to modify working procedure to afford clinic samples more priority than previously. It was also agreed that a presentation of the survey would be made to hospital doctors so that they too would appreciate the laboratory workload and procedures.

Hospital messengers, who had previously had no insight into the meaning of the forms they were transferring from the laboratory to the Department of Community Health, agreed to adapt their schedule to ensure that laboratory results reached the department on the same day that they were released by the laboratory.

Pigeon holes were made for each clinic in the Department of Community Health. All staff agreed routinely to visit the department to collect any relevant clinic documentation before going out to clinics.

The improvement in the recording of syphilis serology results was demonstrated in the repeat clinic-based record survey (Table II). The percentage of antenatal attenders with syphilis serology recorded on their cards indicates an improvement in the recording of syphilis serology at the majority of clinics (14/19). In the first repeat survey, 9 of the 19 clinics had more than 75% of patients' results recorded compared with 5 out of 19 in the first survey. The second repeat survey indicated that this improvement had been maintained or improved further. In all except one of the 12 clinics visited, more than 75% of antenatal care records had syphilis serology recorded and all except one showed an improvement compared with the initial survey.

Table II. Prevalence of recorded syphilis serology on patients' antenatal care cards prior to the study, 2 months after the presentation of the results of the study and 5 months later, ranked by percentage improvement from initial to first repeat survey

Clinic ID No.	Serology recorded prior to study	Serology recorded — 1st repeat survey	Serology recorded — 2nd repeat survey
1	0	84	83
2	20	90	79
3	24	92	88
4	19	66	*
5	6	47	*
6	55	89	89
7	53	83	82
8	54	82	95
9	74	91	*
10	28	42	94
11	79	93	*
12	38	50	72
13	32	39	92
14	44	50	*
15	81	76	87
16	81	75	93
17	72	62	*
18	79	46	*
19	85	No records	79

*Clinics not included in second repeat survey.

The possibility of error or manipulation in the recording of the date on the data sheet was investigated. Data sheets

were checked for inconsistencies and the batches of blood specimens were randomly checked at various stages of their transport. No cases of manipulation of data were found. Bias with regard to non-completion of forms was investigated. There was no consistent pattern in the missing data and it is likely that these omissions were random and therefore did not lead to bias. The possibility of a Hawthorne effect cannot be ruled out. However, dates and times for repeat visits to clinics to assess the number of antenatal care records with syphilis serology recorded were not known to clinic staff, so they could not anticipate this event. Even if it were in operation, the result was nonetheless an improved service. This is in fact the aim of supervision: to keep service providers motivated to maintain or improve service quality.

Conclusions

While it is recognised that rural services are under-resourced and that adequate resources must be a priority, it would be naive simply to wait for such changes to improve on service delivery. Even within existing resources, there is room for improvement in efficiency within the public sector.

Syphilis screening is feasible in this rural area. A turn-around time of 13 days is achievable. Specific objectives for each stage of the process, specifically 7 days maximum in the laboratory, same-day delivery of results from the laboratory to the Department of Community Health and improved return of results to the clinics by use of all available personnel were identified.

Simple studies can be used to assist in management of health services at the local level. These studies are quick and easy, they can be performed by clinic supervisors and can be incorporated into the routine management of health services, thus allowing for ongoing evaluation. In addition, they can be an incentive for improvement if the results of serial surveys are published within the health service. The turn-around time study is a tool that could be used to assist local supervisors in their management functions.

Participatory decision-making within the health service is possible and prevents individuals being blamed. In this case it reinforced the concept of a health team where the effect of the actions of one department on another was illustrated and the impact of this on health was clarified.

Identification of key players who are directly related to the process under investigation results in a better response. All staff members, ranging from cleaners and messengers to the head of the laboratory, are part of the health team and the degree to which this is recognised will impact on management initiatives. The involvement of all relevant staff in this study had a major impact on the subsequent changes in hospital routine.

I would like to thank the staff of the Community Health Department of Nkomazi Health Ward, the superintendent and staff of Shongwe Hospital and especially the clinic staff who work at the 19 clinics of the health ward. This research was supported by a grant from the University of the Witwatersrand Medical Faculty Research Endowment Fund.

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Accepted 30 June 1994.