disease may have been missed in those subjects who failed to attend for screening or who declined investigation once haematuria was found.

Our results show that urine dipsticks, by identifying a high risk group in the male community suitable for investigation, are capable of detecting important urological disease, including bladder cancer. The introduction of less invasive methods of investigation, particularly flexible cystourethroscopy, makes screening for bladder cancer in the community more feasible. The implications for an already overloaded urological service of detecting such a wealth of disease would, however, be enormous and the true value of early detection of cancer will be shown only by a long term controlled study.

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Non-biological factors in day to day variation of heparin requirements

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In the treatment of venous thromboembolic disease the activated partial thromboplastin time should be maintained within one and a half to two and a half times the control.[1] In practice this is difficult to achieve, with frequent day to day variation in the thromboplastin time, requiring regular changes in the dose of heparin.[2] While some variation may be biological, we identified variables in the delivery and monitoring of a heparin infusion in our hospital, which might have influenced the thromboplastin time.

Patients, methods, and results

We monitored two positive pressure infusion devices used to deliver heparin. The IMED 960 (San Diego, California) was monitored on seven patients for 257 hours and the IVAC 560 (San Diego, California) on four patients for 112 hours. The median flow rate was 31 ml/h (range 20 to 50 ml/h). The mean (SD) hourly error in the volume delivered as recorded by each pump was 9 (6)% for the IMED 960 and 15 (9)% for the IVAC 560, with errors of 20% or more in 31 (12%) and 22 (20%) of the hourly observations, respectively. When pumps were unavailable heparin was delivered through a gravity feel roller clamp system, with a reservoir refilled hourly. According to ward charts all patients on this system received the prescribed hourly rate. When three subjects were monitored with a total of 34 random visits, however, coinciding with the midpoint of the hourly infusion, the mean (SD) hourly error calculated from the volume of fluid remaining in the reservoir was 57 (9)%, with 100% of the infusion running through in less than 30 minutes in eight (23%) observations. The reservoirs were sometimes left unfilled for up to one hour.

After collection blood can be left for periods of up to 150 minutes before the thromboplastin time is measured. To assess the effect of this delay 12 patients had two samples of blood drawn consecutively into sodium citrate vacutainers. One was dispatched for immediate measurement, and the other was stored at room temperature and measured 90 to 150 minutes later (mean 113 minutes). There was a mean fall in the thromboplastin time of six seconds (table). Within sample variability of the measurement and the day to day variability with a standard heparinised sample was maintained at two seconds in our laboratory.

Effects of delay in measuring activated partial thromboplastin time in 12 patients

Activated partial thromboplastin time(s)			
Measured immediately	Measured after delay	Delay (mins)	Change in activated partial thromboplastin time(s)*
84	69	80	−15
69	72	90	3
79	82	90	3
76	57	90	−19
54	50	100	−4
52	50	110	−2
88	83	110	−5
71	65	120	−6
55	51	120	−4
43	54	150	11
82	55	150	−27
54	44	150	−10

*Mean (SD) change was −6 (10), two tailed paired *t* test p=0·62.

Comment

Monitoring and adjusting heparin treatment assumes a steady rate of delivery; this is rarely the case. We have confirmed the considerable inaccuracy of a roller clamp system of infusion,[3] which results in peaks and troughs of heparin activity. The IMED 960 is a fairly expensive pump and reported to have a mean hourly error of less than 5%; while some other pumps on the market have errors well in excess of 10%[4]; these figures, however, are based on in vitro laboratory tests. On busy wards pumps cannot be guaranteed the attention required for optimum performance, and accuracy may be compro-

mised. As heparin has a short half life errors of 20% or more, which occurred in 12% and 20% of observations, may influence the thromboplastin time, depending on their relation to when blood is taken for monitoring, the concentration of heparin used, and the flow rate.

Delay in measurement may result in a fall in the thromboplastin time, ascribed to in vitro release of heparin neutralising activity from platelets.[5] We found falls of up to 27 seconds, which could result in unnecessary changes in dose or even a serious underestimate of the thromboplastin time. In view of the factors described fine tuning of the heparin dose may be unrealistic. Control may be improved by following published guidelines,[1] and by aiming for the midpoint of the therapeutic range to accommodate unavoidable sources of variation. Subcutaneous heparin may be a more reliable alternative to infusion, particularly when only a roller clamp system is available.

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Immunisation state of children born before term in the Northern region

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Preterm infants are often followed up by paediatricians trying to audit the activities of neonatal units. Contact with senior paediatricians might be expected to result in higher uptake of immunisations in this group of vulnerable children than in the general population. We carried out a study to assess this.

Patients, methods, and results

As part of a study of all infants who were born before 32 weeks' gestation in the Northern region[1] we looked at the immunisation records kept by health visitors on 230 who had survived two years. We obtained data on 212 of the children.

Diphtheria, tetanus, and polio—Altogether 203 children had received the first dose of diphtheria, tetanus, and polio vaccine. By the age of 2, 173 had completed a course of three doses.

Pertussis—Only 114 had received the first dose of pertussis vaccine and only 97 had had a full course by the age of 2. The parents of 68 had been advised to refuse immunisation against pertussis: 33 by paediatricians, 25 by general practitioners, nine by clinical medical officers, and one by a health visitor. The parents of 30 children had decided to refuse immunisation against pertussis despite the absence of any recognised contraindication. The parents of the 97 children who had not received immunisation against pertussis gave various reasons for this. In 25 cases these reasons were in accordance with guidelines recommended in 1983 by the Department of Health and Social Security: nine children had family histories of epilepsy, three had ventriculoperitoneal shunts, nine had had neonatal fits, three had had intraventricular haemorrhages or clinical evidence of cerebral damage, and one had had meningitis. Four children had not been immunised because they had had apnoea of prematurity, two because they had been adopted, and 36 merely because they had been born before term. Three children who had had mild local reactions to the first dose and four who had had similar reactions to the second dose had not been offered subsequent doses.

Measles—Immunisation against measles had been given to 139 children by the age of 2, and a further 30 were expected to receive it. Reasons given for not immunising the remaining 43 children were: parental wishes (29 children), prematurity (three), history of measles (three), family history of epilepsy (one), ventriculoperitoneal shunt (one), dystrophia myotonica (one), pertussis vaccine not given (one), and neonatal fits (one); no reason was given for three children.

In 75% of our sample immunisations had been delayed according to the degree of prematurity: 72% of diphtheria and tetanus and triple immunisations and 65% of measles immunisations had been delayed. Delay had been advised by paediatricians (58 children), general practitioners (41), and health visitors or clinical medical officers (27).

Comment

Our results compare quite well with the uptake by all children in the region at that time (table) but less well with the uptake by long term survivors of preterm birth in the United States.[2] Only 25 (12%) of the children had valid reasons for avoiding immunisation against pertussis according to the Department of Health and Social Security's guidelines (1983). These reasons were not valid according to the stricter advice of the American Academy of Pediatrics.[3] Forty three children had not been immunised on apparently misguided advice from health professionals.

Completed immunisations by age 2 in children born before term and all children. Figures are percentages of children

	Northern region, 1983		England and Wales, 1983*	United States[2]	
	Born before 32 weeks' gestation	All children	All children	Born weighing <1500 g	All children
Diphtheria	82	85	85	83	97
Tetanus	82	85	85	83	97
Whooping cough	46†	63	65	83	91
Polio	82	85	85	83	97
Measles	66	72	68	NA	96

NA=Not available.
*Source: statistics research divisions of Department of Health and Social Security, 1987.
†49% In babies without recognised contraindications.

Recommendations about the timing of immunisations in children born before term vary greatly among different centres and paediatricians[4]; many neonatal units do not have an agreed policy.[2] Guidelines published by the Department of Health and Social Security in 1988 should have changed this[5]; they recommend that immunisation should not be postponed because of prematurity.

Uptake of immunisations in children born before term could be improved by neonatal units deciding at discharge whether each child is suitable. Parents