Audit of Transfusion Procedures in 660 Hospitals

A College of American Pathologists Q-Probes Study of Patient Identification and Vital Sign Monitoring Frequencies in 16 494 Transfusions

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• ***Context.*—Hemolytic transfusion reactions are often the result of failure to follow established identification and monitoring procedures.**

***Objective.*—To measure the frequencies with which health care workers completed specific transfusion procedures required for laboratory and blood bank accreditation.**

***Design.*—In 2 separate studies, participants in the College of American Pathologists Q-Probes laboratory quality improvement program audited nonemergent red blood cell transfusions prospectively and completed questionnaires profiling their institutions' transfusion policies.**

***Setting and Participants.*—A total of 660 institutions, predominantly in the United States, at which transfusion medicine services are provided.**

***Main Outcome Measures.*—The percentages of transfusions for which participants completed 4 specific components of patient and blood unit identifications, and for which participants monitored vital signs at 3 specific intervals during transfusions.**

***Results.*—In the first study, all components of patient identification procedures were performed in 62.3%, and all required patient vital sign monitoring was performed in 81.6% of 12 448 transfusions audited. The median frequencies with which institutions participating in the first study performed all patient identification and monitoring procedures were 69.0% and 90.2%, respectively. In the second study, all components of patient identification were performed in 25.4% and all patient vital sign monitoring was performed in 88.3% of 4046 transfusions audited. The median frequencies with which institutions participating in the second study performed all patient identification and monitoring procedures were 10.0% and 95.0%, respectively. Individual practices and/or institutional policies associated with greater frequencies of patient identification and/or vital sign monitoring included transporting units of blood directly to patient bedsides, having no more than 1 individual handle blood units in route, checking unit labels against physicians' orders, having patients wear identification tags (wristbands), reading identification information aloud when 2 or more transfusionists participated, using written checklists to guide the administration of blood, instructing health care personnel in transfusion practices, and routinely auditing the administration of transfusions.**

***Conclusions.*—In many hospitals, the functions of identification and vital sign monitoring of patients receiving blood transfusions do not meet laboratory and blood bank accreditation standards. Differences in hospital transfusion policies influence how well health care workers comply with standard practices. We would expect that efforts designed to perfect transfusion policies might also improve performance in those hospitals in which practice compliance is substandard.**

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Hemolytic transfusion reactions may result from the administration of even a few milliliters of incompatible red blood cells. Most instances of incompatible red blood cell administration result from failure of transfusionists to correctly match intended blood recipients with units of compatible blood.[1–5] Organizations that accredit blood banks and laboratories require both meticulous identification of blood recipients and blood, and fastidious monitoring of recipients' vital signs prior to and during their transfusions.[6,7] Published audits documenting the frequency with which health care workers adhere to these elements of accreditation standards have described observations of relatively small numbers of transfusions performed in relatively few institutions.[8–11]

Since 1989, the College of American Pathologists (CAP) Q-Probes program has administered multi-institutional studies that have determined a broad range of performance benchmarks in clinical laboratories. Previous Q-Probes studies have examined quality indicators of both the practice of transfusion medicine[12–16] and the frequencies with which health care workers adhere to accepted standards of performance.[17,18] In this study, we expanded the CAP's database of quality indicators of transfusion medicine by determining the frequency with which health care workers adhered to accepted standards of care in transfusion medicine. Specifically, we measured the fre-

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quencies with which health care workers completed required procedures of matching intended blood recipients with their correct units of blood, and with which they monitored patient vital signs at 3 critical intervals of the transfusion process. In addition, we attempted to identify blood bank and hospital practices and policies associated with greater frequencies with which health care workers performed these tasks.

METHODS

In 2 separate studies, we measured 2 quality indicators of blood transfusion administration: (1) the frequency with which health care workers performed required procedures designed to match patients receiving blood transfusions with their intended blood units and (2) the frequency with which health care workers monitored the vital signs of patients receiving blood transfusions. Institutions enrolled in the CAP's Q-Probes program in 1994 and 2000 participated in these studies. The studies were conducted and the data were handled similarly to that previously described.[19] On their enrollments into the Q-Probes program, participants from each institution submitted certain demographic information, including their hospitals' geographic locations, community types (urban, suburban, rural, etc), teaching status, occupied bed sizes, hospital and laboratory accreditation status, and whether their institutions maintained pathology teaching programs.

In the first study, performed in 1994, blood bank workers were instructed to audit prospectively for 6 months or up to 30 different nonemergent red blood cell transfusions. Each audit commenced at the moment the blood unit was released from the blood bank and continued through the first 20 minutes during which the transfusion was administered. In the second study, performed 6 years later in 2000 in response to requests from laboratory personnel nationwide that this Q-Probes study be repeated, blood bank workers were instructed to conduct similar observations for a period of 3 months or in up to 20 different nonemergent red blood cell transfusions. In both studies, participants were instructed to select and follow units at their own conveniences, to visit as many different patient care areas as possible, and to be as inconspicuous as possible so as to avoid biasing transfusionists. They were also instructed not to audit units transfused in outpatient care areas, operating rooms, emergency departments, patient care areas where units of blood were routinely stored for long periods of time prior to transfusions, and in emergency situations when compatibility testing might be eliminated.

We defined patient and unit identification as being completed only when audits documented that all 4 of the following conditions were met for the monitored transfusion: (1) the patient's orally stated name was matched with that on the patient's identification band (eg, wristband); (2) the patient's identification band was matched with that on the blood bag compatibility label; (3) the patient's name and identification band were matched with the identification information on the blood request form; and (4) the patient's name and identification number on the blood request form were compared with the results of compatibility testing and with the expiration dates on the blood bag identification and compatibility tag(s).

We defined patient vital sign monitoring as being completed only if audits documented that transfusionists measured vital signs at 3 specific intervals during the transfusion process: (1) immediately prior to beginning the transfusion, (2) within the first 15 minutes after the transfusion was started, and (3) between the first 15 and 20 minutes after the transfusion was started.

To determine what individual practices might have influenced the frequencies of identification and monitoring of patients' vital signs we had participants identify for each audited transfusion:

- the types of health care workers delivering blood to patients;
- whether cross-checks of the patient, blood bag compatibility tag, and blood request form were performed at the time of blood release and/or arrival in the patient care area;
- the number of health care workers handling the unit between the time that the blood was released from the blood bank and the time that the unit was transfused into the patient;
- whether the transfusionist used a written checklist to guide the administration of the transfusion;
- whether the transfusionist checked the unit label against the physician's order prior to administering the transfusion; and
- whether the individual transporting the unit brought it directly to the patient care area or made 1 or more stops along the way.

To determine what institutional transfusion policies might have influenced the frequencies of patient identification and vital sign monitoring, participants were instructed to indicate on a detailed questionnaire whether institutional transfusion policies:

- specified the types of health care workers allowed to transfuse blood products;
- maintained mandatory programs educating health care workers in the administration of blood transfusions and in the proper identification of patients and blood units;
- specified what requirements for identification of blood recipients had to be performed when units of blood were released from the laboratories;
- required transfusionists to review transfusion procedures immediately prior to administering each transfusion;
- required that the names of the blood recipients be recorded in laboratory or blood bank logs;
- required transfusionists to routinely use written checklists to guide administration of transfusions;
- required transfusionists to autograph blood request forms verifying that recipients had been properly identified;
- required that transfusions be routinely monitored at bedsides;
- required that transfusions be administered by specialized transfusion teams;
- required written physician's orders for transfusions and required that those orders be verified prior to transfusing patients; and
- required that patient and blood identifications be read aloud when more than 1 transfusionist administered blood.

Although the content of the questions concerning institutional practices was the same in both studies, the manner in which the questions were posed were not always the same. For instance, some questions that appeared as yes-no responses in the first study were rephrased as ''check all that apply'' in the second study. From the aggregate data, we calculated the overall rates of frequencies of patient identification and vital sign monitoring. We demonstrated the associations of the individual transfusion practices with those overall rates by recalculating those rates in the presence and in the absence of each individual practice. We tested for differences between groups using χ^2 tests.

We also calculated the frequency rates for each participating institution and organized those rates into percentiles. Percentile ranks were used to compare performance among institutions. We demonstrated the effects of institutional demographics and policies on the institutional frequency rates by calculating the median rates of frequency in the presence and in the absence of each demographic and institutional policy. We tested for differences among these groups using Kruskal-Wallis and Wilcoxon tests. If a participant failed to answer a question for any of the requested demographic, transfusion, or practice characteristics, that participant's data were excluded from the database for that question only. We considered a P value of .01 or less to be statistically significant.

RESULTS

Blood bank workers representing 660 institutions, located primarily in 49 states of the United States, participated in at least 1 of the 2 studies. Blood bank workers in 92 of these institutions participated in both studies. Table

Table 1. Demographic Representation of Participating Institutions

Demographic Characters	Participating Institutions, % 1994 (n = 519)	2000 (n = 233)
Nationality		
United States	97.0	95.3
Canada	1.7	2.2
Australia	1.0	1.3
United Kingdom	0.0	0.4
New Zealand	0.2	0.0
Spain	0.0	0.4
South Korea	0.0	0.4
Locations		
City	71.9	52.7
Suburban	16.8	20.9
Rural	9.9	25.8
Federal installation	0.4	0.6
Other	1.0	0.0
Average occupied bed size		
<151	24.8	48.8
151–300	41.3	31.5
301–450	19.8	9.5
451–600	6.3	5.4
>600	7.6	4.8
Teaching status		
Teaching	38.6	27.0
Nonteaching	61.4	73.0
Special departments/procedures		
Emergency	97.6	Demographic
Medical intensive care unit	93.1	not
Surgical intensive care unit	83.6	obtained
Hematology/oncology	83.2	
Open heart surgery	53.7	
Accreditation status*		
JCAHO (hospitals)	89.8	93.2
CAP (laboratories)	76.4	80.9

* JCAHO indicates Joint Commission on Accreditation of Healthcare Organizations; CAP, College of American Pathologists.

Table 2. Aggregate Rates of Quality Indicators: Frequencies of Completion of Patient Identification and Vital Sign Monitoring Procedures

Quality Indicator	Transfusions, % 1994 (n = 12 448)	2000 (n = 4046)
Frequency of patient identification procedures completed		
Stated patient name matched with wristband identification	67.8	43.1
Wristband identification matched with blood bag compatibility label	88.9	75.7
Patient's name and wristband identification matched with blood request form	87.8	54.1
Patient's name and identification number on blood request form compared with results of compatibility testing and with expiration dates on blood bag	95.3	73.0
Completion of *all* 4 of the above-listed patient identification procedures	62.3	25.4
Frequency of patient vital sign monitoring intervals completed		
Vital signs checked prior to initiating transfusion	96.9	98.1
Vital signs checked during the first 15 min of transfusion	90.7	92.7
Vital signs checked after first 15 min of transfusion	89.7	95.1
Completion of *all* 3 of the above-listed patient vital sign monitoring intervals	81.6	88.3

1 summarizes the demographic information of all participants.

Participants monitored 12 448 transfusions in the first study and 4046 transfusions in the second study. Table 2 shows the rates with which health care workers were observed to perform patient identification and vital sign monitoring during these transfusions. For example, in the first study all 4 patient identification procedures were completed in 62.3% of 12 448 audited transfusions. In only 67.8% of those 12 448 transfusions, patients' stated names were matched with wristband identifications. Similarly, in the second study, patient vital sign monitoring was performed at all 3 intervals in 88.3% of 4046 audited transfusions. In 98.1% of audited transfusions, patient vital signs were checked prior to initiating transfusions.

Table 3 lists the transfusion practices observed during transfusions audited in these 2 studies. For instance, in both studies blood was both transported and transfused predominately by nurses rather than by other types of health care personnel (77.8% and 73.5%, and 92.7% and 95.5% in 1994 and 2000, respectively). Table 4 displays those practices significantly associated ($P \leq .01$) with completion of patient identification and vital sign monitoring procedures observed during each audited transfusion. For example, in both studies greater percentages of identification procedures were observed to be completed in each audited transfusion when health care workers used written checklists to guide the administration of transfusions compared to when no such checklists were used (77.3% vs 58.8% and 40.5% vs 22.4%, respectively). In the first study, monitoring of patients' vital signs was observed to be completed at all 3 intervals in a greater number of audited transfusions when nurses administered the transfusions compared to when other types of health care personnel administered the transfusions (82.3% vs 72.6%). In the second study, this difference was not statistically significant. The frequencies with which patient identification and vital sign monitoring were completed for each transfusion were not associated with whether cross-checks of the patient, blood bag compatibility tag, and blood request form were performed at the time of blood release and/or on arrival in the patient care areas.

Table 5 shows the percentile distribution of the frequency with which health care workers representing 660 institutions in both studies performed patient identification and vital sign monitoring. For instance, in the first study, among the top-performing 10% (90th percentile or greater) of 519 participating hospitals, all 4 components of patient identification were completed in all audited transfusions. Among the bottom-performing 10% (10th percentile or less) of participants, all 4 components of required patient identification were completed in 10% or fewer of audited transfusions. In the median institution, required patient identification was performed in 69.0% of the audited transfusions. Similarly, among the top-performing 75% (75th percentile or greater) of 233 participating hos-

Table 3. Aggregate Percentages of Individual Transfusion Practices Observed During Audited Transfusions

Practices During Monitored Transfusions	Transfusions, %* 1994	2000
Health care workers/systems transporting blood		
Nurses or nursing department couriers	77.8	73.5
Laboratory technologists or laboratory couriers	5.3	5.8
Transfusion team member	4.2	3.3
Mechanical/pneumatic transport systems	2.4	10.7
Physicians, medical students, hospital volunteers, others	10.3	6.7
Route of transfusion unit from blood bank to patient		
Taken directly to patients' locations	70.0	74.5
Taken directly to transfusionist	38.5	38.3
Left on a counter in patient care area	11.7	7.5
Given to another member of patient care team	9.7	7.7
Delivered after interim stops	5.3	4.1
Stored in refrigerator in patient care area	0.5	0.2
Other	1.0	0.9
Health care workers administering blood		
Patient care area nurse	92.7	95.5
Transfusion team member	6.3	4.2
Physician, medical student, other	2.4	1.2
No. of people in possession of the unit		
1	49.7	57.3
2	39.8	36.0
>2	10.5	6.7
Time of cross-checks between patient and unit identification information and the blood bag compatibility tag and the blood request form		
At release of units from blood bank and delivery of units to patient care areas	63.5	71.0
On release of units from blood bank only	32.8	25.6
On delivery of units to patient care areas only	6.1	3.3
Never	1.1	0.1
Used a written checklist to guide the administration of the transfusion	18.1	16.8
Checked blood unit label against the physician's written order immediately prior to transfusion	48.9	38.5
Patient wearing a limb identification band (eg, wristband)	97.9	97.4

* **Note.**—These percentages are determined from the audits of 12 298 to 12 404 transfusions for the 1994 study and 4030 to 4046 transfusions for the 2000 study.

Table 4. Relationships Between the Aggregate Percentages of Quality Indicators With Transfusion Practices*

Transfusion Variable	Aggregate Percentage of Transfusions 1994	2000
Quality Indicator: Frequency of Completion of All 4 Patient Identification Procedures		
Health care workers transporting blood		
Nursing	63.1	27.1
Nonnursing	58.8	20.8
Health care workers administering blood		
Nursing	60.8	NS
Nonnursing	76.8	
Route of transfusion unit from blood bank to patient		
Taken directly	63.0	26.8
Not taken directly	57.4	14.4
No. of people in possession of unit prior to administration		
1	65.9	NS
>1	58.5	
Written checklist to guide the transfusion administration		
Yes	77.3	40.5
No	58.8	22.4
Check unit label against the physician's order		
Yes	72.7	41.1
No	52.2	15.6
Patient wearing wristband		
Yes	62.2	26.0
No	38.5	4.8
Quality Indicator: Frequency of Completion of All 3 Patient Vital Sign Monitoring Intervals		
Health care workers administering blood		
Nursing	82.3	NS
Nonnursing	72.6	

* Associations shown only for values of $P \leq .01$. NS indicates not significant.

pitals in the second study, all 3 components of patient vital sign monitoring were completed in all audited transfusions. Among the bottom-performing 10% (10th percentile or less) of participants, all 3 components of vital sign monitoring were performed in 63.6% or fewer of audited transfusions. In the median institution, all 3 components of vital sign monitoring were performed in 95.0% of audited transfusions.

Table 6 lists the transfusion policies of institutions par-

Table 5. Percentile Distribution of the Frequency With Which Participants Completed All Components of the Quality Indicators

Quality Indicators	All Institutions Percentiles, % 1994 (No. of Institutions = 519) 10th	25th	50th	75th	90th	2000 (No. of Institutions = 233) 10th	25th	50th	75th	90th
Frequency of										
Patient identification*	10.0	35.7	69.0	92.9	100.0	0.0	0.0	10.0	40.0	73.7
Patient vital sign monitoring†	46.2	75.0	90.2	100.0	100.0	63.6	84.2	95.0	100.0	100.0

* Patient identification components: stated patient name matched with wristband identification, wristband identification matched with blood bag compatibility label, patient's name and wristband identification matched with blood request form, and patient's name and identification number on blood request form compared with results of compatibility testing and with expiration dates on blood bag.

† Vital sign monitoring intervals: vital signs checked prior to initiating, during first 15 min, and after first 15 min of transfusion.

Table 6. Institutional Transfusion Policies

Practice Characteristic	Percentage of Institutions* 1994	2000
Persons authorized to administer blood in general		
Nurse	97.0	99.5
Physician	70.6	58.5
Transfusion team member	13.3	7.1
Other	13.1	5.7
Department personnel who monitor the administration of transfusion		
Nursing	23.3	28.3
Laboratory	13.0	36.8
Quality management	5.5	8.5
Other	2.2	0.5
None	65.3	38.2
Health care personnel receiving course of instruction for administering transfusions		
Nurses	89.0	93.4
House staff	9.8	7.8
Attending physicians	3.5	1.5
Blood couriers receive instructions on proper patient identification	54.0	66.5
Policy or procedure specifies requirements for identification of intended recipient of blood	98.2	97.7
Transfusion protocols include pretransfusion procedures requiring the following:		
Names of individual to whom blood is released are recorded in logs	91.3	96.2
Transfusionists review transfusion policies	5.0	6.6
Blood product labels are checked against physicians' written orders	42.6	41.0
Physicians' transfusion orders are recorded in patients' records	92.5	96.2
Transfusionists autograph blood request forms to document proper identification	97.2	98.6
Transfusion protocols include bedside procedures requiring the following:		
Written checklists guide administration of each transfusion	21.3	26.8
A specified number of individuals identify blood units and patients	95.8	97.2
At least 2 individuals identify both blood units and patients	98.3	97.6
Patients' wristbands and blood bag identifications are read aloud when blood is transfused by more than 1 transfusionist	72.7	86.7

* **Note.**—These percentages are determined from institutions submitting policy information, the numbers of which range from 402 to 497 for the 1994 study and 167 to 213 for the 2000 study.

ticipating in both studies. For example, in both studies most hospital transfusion policies required that nurses receive courses of instruction for administering transfusions (89.0% and 93.4% for 1994 and 2000, respectively), and relatively few policies required that transfusionists review transfusion policies prior to administering transfusions (5.0% and 6.6%, respectively).

Table 7 displays those institutional demographics significantly associated ($P \leq .01$) with institutional performance of patient identification and monitoring during the transfusions audited in this study. For instance, in the first study the frequency with which health care workers completed all 3 components of patient vital signs monitoring was greater in noncity than in city hospitals (95.5% vs 86.7% in 1994 and 2000, respectively).

Table 7. Relationships Between Institutional Frequencies of Quality Indicators With Institutional Demographics*

Institutional Demographic	Median Percent 1994	2000
Quality Indicator: Frequency of Completion of All 4 Patient Identification Procedures		
Open heart surgery performed		
Yes	63.0	Question
No	76.7	not asked
Quality Indicator: Frequency of Completion of All 3 Patient Vital Sign Monitoring Intervals		
Locations		
City	86.7	NS
Noncity	95.5	
Average occupied bed size		
≤300	NS	95.0
>300		80.0
Hospital accredited by Joint Commission on Accreditation of Healthcare Organizations		
Yes	90.0	95.0
No	70.8	70.0
Surgical intensive care unit		
Yes	87.5	Question
No	96.6	not asked

* Associations shown only for values of $P \leq .01$. NS indicates not significant.

Table 8 displays those institutional policies significantly associated ($P \leq .01$) with institutional performance of patient identification and vital sign monitoring during transfusions audited in this study. For example, in both studies the frequency with which health care workers completed all identification procedures was greater in institutions that had policies requiring health care workers to use written checklists to guide the administration of transfusions than it was in institutions that had no such policies (86.2% vs 64.3% and 25.0% vs 5.3% for 1994 and 2000, respectively). Similarly, in the second study, the frequency with which health care workers completed all patient vital sign monitoring was greater in those institutions that had policies requiring that nursing personnel receive courses of instruction on administering blood compared to institutions that had no such policies (95.0% vs 80.0%, respectively). Institutional performances of patient identification and monitoring were not associated with other hospital policies, including requirements that identification of blood recipients be performed at the time of blood release from the laboratory, transfusionists review transfusion procedures prior to administering transfusions, the names of the blood recipients be recorded on log sheets, transfusionists autograph blood request forms, written physician's orders be verified prior to transfusing patients, and blood be transfused by specialized transfusion teams.

COMMENT

We determined the frequency with which health care workers performing blood transfusions completed all of 4 components of patient identification and patient vital sign monitoring at 3 specific intervals prior to and during the

Table 8. Relationships Between the Institutional Frequencies of Quality Indicators With Institutional Transfusion Policies*

Institutional Policies	Median Percent 1994	2000
Quality Indicator: Frequency of Completion of All 4 Patient Identification Procedures		
Health care workers monitor administration of all transfusions		
Yes	84.5	NS
No	62.1	
Blood couriers receive instructions on blood and patient identification		
Yes	76.3	NS
No	59.2	
Transfusionists use written checklists to guide administration of each transfusion		
Yes	86.2	25.0
No	64.3	5.3
If more than 1 transfusionist administering blood, identifications read aloud		
Yes	79.7	NS
No	48.3	
Quality Indicator: Frequency of Completion of All 3 Patient Vital Sign Monitoring Intervals		
Health care workers monitor administration of all transfusions		
Yes	95.1	NS
No	86.7	
Nursing personnel receive course of instruction on administering blood		
Yes	NS	95.0
No		80.0
Blood couriers receive instructions on blood and patient identification		
Yes	93.3	100.0
No	85.7	90.0
Transfusionists use checklists to guide administration of each transfusion		
Yes	96.4	NS
No	88.0	

* Associations shown only for values of $P \leq .01$. NS indicates not significant.

administrations of those transfusions. The choice of these quality indicators of transfusion practice was not arbitrary. Strict adherence to protocols designed to ensure that units of blood are properly matched with their intended recipients and to ensure that the vital signs of patients receiving blood transfusions are properly monitored are requirements for blood bank accreditation[6,7] and are elucidated in the American Association of Blood Banks' technical manual.[20] We did not tabulate how many of the individual component elements of patient identification or monitoring may have been omitted in each transfusion because we did not want to lend even minimal credibility to the notion that the frequency of adherence to these procedures might somehow be additive. Accreditation standards aside, we believe that it would be unacceptable to any practitioner that blood would ever be administered with anything less than meticulous adherence to proper identification of patients prior to transfusion and proper monitoring of their vital signs throughout transfusion.

Q-Probes studies are well suited to determine the normative rates of adherence to these protocols in general practice. Unlike most published studies that describe the experiences of individual institutions, many of which are academic and/or presumably have homogeneous practice environments, Q-Probes studies reflect the daily experiences of a large, heterogeneous group of hospitals, which serve diverse community populations and which vary widely in their practice characteristics. They provide a snapshot of laboratory practice in the United States. By having the normative rates of selected parameters of quality available to them, participants in Q-Probes studies are able to derive benchmarks of quality that they believe are appropriate to apply in their own communities.

This study did not validate the legitimacy of whether adherence to standard required blood bank protocols were reasonable indicators of transfusion errors. Such an investigation would require associating adherence to blood bank protocol with the incidence of hemolytic transfusion reactions. The relatively low incidence of hemolytic transfusion reactions would require conducting this study for a length of time greater than that which Q-Probes studies are designed to span.

In these 2 studies, health care workers in a combined total of 660 hospitals audited 16 494 nonemergent elective transfusions. Compared to the second study, the first study included slightly less than twice the number of hospitals (519 vs 233) and included hospitals that were more commonly located in urban settings (71.9% vs 52.7%), contained greater than 300 beds (33.7% vs 19.7%), and were more likely to conduct teaching programs (38.6% vs 27.0%).

In the first study, all 4 components of patient identification were completed in less than two thirds (62.3%) of audited transfusions. In the second study, performed 6 years later, all 4 components of patient identification were completed in about a quarter (25.4%) of audited transfusions. This decrease occurred despite the greater incidences of certain institutional transfusions policies (presumably designed to improve blood-administering practices) in those institutions participating in the second study compared to those participating in the first study. For example, compared to the incidences of transfusion policies in hospitals participating in the first study, those requiring that blood couriers receive instructions on proper patient identification, transfusionists use written checklists to guide blood administration, and transfusionists read patient identification information aloud when more than 1 individual was involved in transfusing blood were greater in hospitals participating in the second study (66.5% vs 54.0%, 26.8% vs 21.3%, and 86.7 vs 72.7% for 1994 and 2000, respectively).

We did not collect data to determine the reasons why these incidences were greater in hospitals participating in the second study, and specifically, whether they reflected a growing public awareness of medical errors. Furthermore, the design of these studies did not allow us to explain why the frequency with which all 4 components of patient identification were completed was less in the second study, nor did it allow us to analyze any trends in the performance of 92 participants that repeated this study. Although the content of questions concerning institutional practices was the same in both studies, the manner in which they were posed was not always the same. Consequently, they might have been interpreted differently by personnel conducting the studies for repeating

hospitals. In fact, the actual personnel responsible for conducting the 2 studies might have changed in the 6-year hiatus between them. Also, the practice environments in hospitals may have changed over time in ways that the unaltered content of our questionnaire would not have taken into account. In general, Q-Probes studies are designed as 1-time overviews of performance and are not the ideal tools for tracking performance over time. For this reason, the CAP has developed the Q-Tracks program. Q-Tracks studies are specifically designed to monitor the continuous performance of selected quality indicators in laboratory medicine and pathology by health care personnel, and to compare this continuous performance among peer laboratories.[21–23]

In both studies, the identification procedure most commonly omitted was the failure of transfusionists to match patients' stated names with their wristband identifications. Transfusionists participating in the second study matched patient names and wristband identifications with identifying information on blood request forms in a little more than half (54.1%) of the audited transfusions. Transfusionists participating in both studies did a better job of monitoring patients' vital signs (81.6% and 88.3% for 1994 and 2000, respectively). Of the 3 intervals during which monitoring was supposed to have taken place, monitoring vital signs prior to initiating transfusions was the most likely interval to be performed in both studies (96.9% and 98.1% for 1994 and 2000, respectively).

We determined the effects on the quality indicators of specific practices observed during each transfusion audit. In both studies, blood units were both transported and transfused more commonly by nurses than by other types of health care workers. The frequency with which all patient identification procedures were completed was greater when nurses rather than other types of health care workers transported blood. However, in the first study, all components of patient identification were performed more frequently when nonnurses rather than nurses transfused blood. Perhaps nurses do not feel compelled to run through all the elements of identification for patients whom they have been caring for and whom they may already know well. All instances of vital sign monitoring were more frequently performed when nurses rather than nonnurses administered blood transfusions. We do not believe that there is anything inherent in the characteristics of individuals who choose to enter one type of health care profession that might cause them to outperform or underperform individuals who choose to enter other types of health care professions. We suspect that the difference lies in the training and in the expectations of these workers. Developing systems that guarantee adequate training in transfusion practices and developing the culture of excellence that shapes performance are time-consuming, but necessary efforts in providing high-quality and safe care.

In 1 or both of these studies, the frequency with which all patient identification procedures was completed was greater when blood was transported directly to the bedside than when it traveled by circuitous routes, when it was handled by no more than 1 individual, when written checklists guided the administration of transfusions, when transfusionists checked the unit labels against physicians' orders, and when patients wore identification tags (wristbands). A previous Q-Probes study showed that failure of patients to wear identification tags was the most common source of error in patient identification.[13] A recent CAP Q-Tracks study has shown reduced errors in patient identification when hospitals continuously monitor patients for the presence of wristbands.[21]

In addition to determining the frequencies with which individual health care workers completed patient identification and vital sign monitoring, we determined the overall frequencies with which these functions were completed within entire institutions. Among the top-performing quarter (75th percentile and greater) of 519 institutions participating in the first study, all 4 elements of patient identification were completed in 92.9% or greater of audited transfusions. Among the bottom-performing quarter (25th percentile and less), all 4 elements of patient identification were completed in 35.7% or fewer of audited transfusions. Among the top-performing quarter of 233 hospitals participating in the second study, all 4 required elements of patient identification were completed in 40% or greater of the audited transfusions, whereas in the bottom-performing quarter, none of the transfusions had all identification components completed. Institutional performance was considerably better with regard to the monitoring of patient vital signs. In both studies, among the top-performing quarter of hospitals (75th percentile and greater), all monitoring of patient vital signs was performed at all 3 intervals. Among the bottom-performing quarter of institutions (25th percentile and less), monitoring of patient vital signs was performed at all 3 intervals in 75.0% or fewer (first study) and in 84.2% or fewer (second study) audited transfusions.

In 1 or both studies, completion of all vital sign monitoring was performed more frequently in hospitals located in noncity environments, containing fewer than 300 beds, accredited by the Joint Commission on Accreditation of Healthcare Organizations, and not having surgical intensive care units. All components of patient identification were more often completed in hospitals in which open heart surgery was not performed. We did not gather data to explain why adherence to patient identification and monitoring protocols might be influenced by these demographics.

We determined the effects of hospital transfusion policies on the completion of all patient identification and vital sign monitoring procedures within institutions. The data from these studies provide some direction for blood bank workers seeking institutional policies to help improve performance. For instance, in 1 or both of the studies the frequencies with which all elements of patient identification and monitoring were completed were greater in institutions that had transfusion policies mandating that transfusions be monitored, transfusionists use written checklists to guide the administration of blood transfusions, and blood couriers receive instructions on proper blood and patient identification. The frequency with which all elements of patient identification were completed was also greater in those institutions that had policies requiring that patient and blood identifications be read aloud when more than 1 transfusionist administers blood. The frequency with which patient vital sign monitoring was completed at all intervals was greater in those institutions in which nursing personnel received courses of instruction on administering blood. Others have shown that improved compliance with transfusion protocols follows both the institution of educational programs in transfusion practices and the initiation of routine auditing of transfusions.[8,9,11] Auditing transfusions by direct observation has been

shown to be a more efficient method of detecting deviations from standard operating practices than relying on incident reporting of aberrant occurrences.[10]

Other institutional transfusion policies about which we inquired, including the time at which identification of blood recipients was performed, review of transfusion procedures prior to administering transfusions, use of log sheets, autographing of blood request forms, verifying physician's orders prior to transfusion, and employment of specialized transfusion teams, did not influence the frequencies of patient identification or patient vital sign monitoring. That is not to say that adopting some of these practices would not improve performance in certain institutions. We have no way of knowing whether personnel in better-performing institutions lacking these practices compensated for their lack by using other practices about which we neglected to inquire, or whether in worse-performing institutions where personnel did use these practices there were other operational flaws about which we also neglected to inquire. Certainly, in hospitals in which adherence to required protocols was poor, especially those performing at or below the bottom 25th percentile, health care workers might do well to investigate the possibility that any of the practices enumerated in this study would improve performance.

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