Use of Temporary Names for Newborns and Associated Risks

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abstract

BACKGROUND: Because there can be no delay in providing identification wristbands to newborns, some hospitals assign newborns temporary first names such as Babyboy or Babygirl. These nondistinct naming conventions result in a large number of patients with similar identifiers in NICUs. To determine the level of risk associated with nondistinct naming conventions, we performed an intervention study to evaluate if assigning distinct first names at birth would result in a reduction in wrong-patient errors.

METHODS: We conducted a 2-year before/after implementation study to examine the effect of a distinct naming convention that incorporates the mother's first name into the newborn's first name (eg, Wendysgirl) on the incidence of wrong-patient errors. We used the Retract-and-Reorder (RAR) tool, an established, automated tool for detecting the outcome of wrong-patient electronic orders. The RAR tool identifies orders placed on a patient that are retracted within 10 minutes and then placed by the same clinician on a different patient within the next 10 minutes.

RESULTS: The reduction in RAR events post- versus preintervention was 36.3%. After accounting for clusters of orders within order sessions, the odds ratio of an RAR event post- versus preintervention was 0.64 (95% confidence interval: 0.42–0.97).

CONCLUSIONS: The study results suggest that nondistinct naming conventions are associated with an increased risk of wrong-patient errors and that this risk can be mitigated by changing to a more distinct naming convention.

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WHAT'S KNOWN ON THIS SUBJECT: Because there can be no delay in providing newborns with identification wristbands, some hospitals assign newborns temporary first names such as Babyboy or Babygirl. These nondistinct naming conventions result in a large number of patients with similar identifiers in NICUs.

WHAT THIS STUDY ADDS: We performed an intervention study to determine if assigning distinct first names at birth would result in a reduction in wrong-patient errors. We used the Retract-and-Reorder tool, an established, automated tool to detect the outcome measure of wrong-patient electronic orders.

ARTICLE

In 2012 there were 4 million infants born in US hospitals, with ~12% being admitted to NICUs.[1,2] The *Eunice Kennedy Shriver* National Institute of Child Health and Human Development identified wrong-patient errors in NICUs as 1 of 5 domains of errors in neonatology that require further research.[3] Because there can be no delay in registering newborns and giving them identification wristbands, some hospitals assign newborns temporary first names, such as Babyboy or Babygirl. One theory why NICUs are prone to wrong-patient errors is the use of these nondistinct first names; however, no studies have provided direct evidence to support this hypothesis, nor have any demonstrated if transitioning to a naming convention that better distinguishes neonates from one another would prevent wrong-patient errors.

A 2004 study by Suresh et al[4] found that of the 1230 medical errors reported by 54 NICUs in the Vermont Oxford Network, 136 (11.1%) were categorized as patient misidentification errors. In a subsequent study, Gray et al[5] found that just over half of the average daily census in the NICU had similar identifiers to each other. The researchers hypothesized that the high proportion of patients in the NICU with similar identifiers increased the risk of misidentification, but they did not measure wrong-patient errors.

The Distinct Naming Convention Trial (DISTINCT) aimed to test the hypothesis that temporary, nondistinct names for newborns such as Babyboy or Babygirl increase the frequency of wrong-patient errors and that using a unique first name at birth would be associated with a decrease in wrong-patient errors in the NICU.

METHODS

Overview of the DISTINCT Study

The main hypothesis of the DISTINCT study is that nondistinct temporary first names (eg, Babygirl) do not convey the added discrimination typically provided by unique first names, increasing the risk of orders being place on the wrong-patient in an NICU. As shown in Fig 1, the DISTINCT study incorporated the mother's first name into the newborn's temporary first name (eg, Wendysgirl) to provide an added level of distinction normally rendered by a unique first name and then examined the wrong-patient error rates in the NICU before and after implementing this new naming convention.

Settings

The DISTINCT study was conducted at Montefiore Medical Center, an academic health system in Bronx, New York, affiliated with the Albert Einstein College of Medicine and which includes 3 general hospitals, 1 children's hospital, and 2 NICUs (a level IV NICU with 35 beds and a level III NICU with 15 beds). Both NICUs use the same computerized provider order entry (CPOE) system. The level IV NICU is an academic environment staffed by residents, fellows, and attending neonatologists and is the regional perinatal center and referral hospital that provides care for the most complex and critically ill neonates. The level III NICU is staffed by attending neonatologists, nurse practitioners, and physician assistants, without house staff. The intervention study was approved by the institutional review board at the Albert Einstein College of Medicine.

Intervention

On July 1, 2013, a new distinct naming convention that incorporates the mother's first name was implemented for all children born at Montefiore Medical Center (Fig 2), replacing the previous nondistinct naming convention of Babyboy/Babygirl. The new distinct naming convention for newborn infants included the mother's first name, followed by the letter "s", and then the gender of the infant (eg, Wendysgirl). For multiple births, a number was added to the front of the first name (1, 2, etc) to distinguish siblings from each other (eg, 1Judysgirl, 2Judysgirl). Clerical staff in the hospitals' admitting departments were trained to use the new naming convention when creating an account for a newborn. This study was performed within Montefiore's GE Centricity CPOE system (GE Healthcare, Milwaukee, WI).

Outcome Measure

To measure wrong-patient errors, we used the Retract-and-Reorder (RAR) tool, a validated and reliable method for identifying wrong-patient errors.[6] The RAR tool identifies orders placed on a patient that are retracted within 10 minutes and then placed by the

Nondistinct Naming Convention		Distinct Naming Convention	
MRN	Patient Name	MRN	Patient Name
0012385	Babygirl Jackson	0012385	Wendysgirl Jackson
0012352	Babygirl Johnson	0012352	Brendasgirl Johnson
0012357	Babygirl Jones	0012357	Catherinesgirl Jones

FIGURE 1

Temporary names are made more distinct by incorporating the mother's first name into the newborn's first name. MRN, Medical Record Number.

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New Naming Convention for Single Births	New Naming Convention for Multiple Births

• No longer use Babyboy/Babygirl for the first name
• For single births, newborns are given temporary names as follows:
  ○ The mother's first name (up to a maximum of 10 characters)
  ○ 1 character suffix ("s")
  ○ 3- to 4-character gender (boy or girl)
• **Example:** Babygirl Smith → Judysgirl Smith
	• No longer use Babyboy/Babygirl for the first name
	• For multiple births, newborns will be given temporary names as follows:
	  ○ First-digit numbering (1, 2, etc)
	  ○ The mother's first name (up to a maximum of 10 characters)
	  ○ 1 character suffix ("s")
	  ○ 3- to 4-character gender (boy or girl)
	• **Example:** BabygirlA & BabygirlB → 1Judysgirl & 2Judysgirl

FIGURE 2
Description of the new naming convention used in the DISTINCT study.

same clinician on a different patient within the next 10 minutes. Previous research suggested that 76.2% of RAR events represent wrong-patient errors.[6]

RAR events are near-miss errors, self-caught by the clinician before they reach the patient. The *Eunice Kennedy Shriver* National Institute of Child Health and Human Development defines near-miss errors as "those errors that do not result in patient harm due to chance or timely interventions."[7] The use of near-miss errors to test safety improvements in health care is encouraged by major patient safety organizations because near-miss errors have been shown by industrial safety experts to have the same causal pathway as errors that cause harm.[8–12]

Statistical Analysis

To determine the duration of the study, we performed a sample size calculation. Assuming a baseline error rate of 60 RAR events per 100 000 orders,[13] and assuming an estimated effect size that was based on previous wrong-patient error research,[6] our study duration of 1 year of control data collection and 1 year of intervention data collection provided >90% power to detect a 40% reduction in the odds of an RAR event. The effect size (ie, 40% reduction in RAR events) that we used for this calculation is taken from

the results of a randomized controlled trial that evaluated the efficacy of an improved patient identification system for preventing wrong-patient electronic orders.[6] Data were analyzed by using Stata version 13.1IC (StataCorp, College Station, TX).

The RAR order rates in the study NICUs were measured for 1 year before (July 1, 2012 to June 30, 2013) and after (July 1, 2013 to June 30, 2014) the implementation of the distinct naming intervention. The RAR order rate is defined as the number of RAR events divided by the number of orders. All NICU orders during the control and intervention periods, including medications, blood tests, imaging, and general care orders, were entered by using the CPOE system and were included in the analysis. All order data and RAR events were extracted from Montefiore's electronic medical records.

Because orders are clustered within order sessions in which a provider places multiple orders on a single patient, we used general estimating equations to estimate the odds ratio (OR) of an RAR event using the distinct naming convention versus the nondistinct naming convention with cluster-robust SEs. As an exploratory analysis to determine if the benefit of the distinct naming convention was similar across different types of providers and

patients, we constructed separate generalized estimating equation models for patient subgroups (gender, ages, racial/ethnic categories, and insurance) and provider subgroups (attending physician, house staff, nurse practitioners, and physician assistants). Subgroups with <2000 orders per year in total were included as "other." In addition, subgroups with no RAR events in either the intervention or control periods were excluded from the exploratory analysis.

RESULTS

Patient demographic characteristics, including gender, race/ethnicity, and insurance, as well as provider characteristics are shown in Table 1. During the preintervention period there were 157 857 total orders placed for 1115 neonates; during the postintervention period there were 142 437 orders placed for 1067 neonates. A breakdown of RAR events by patient type, provider type, and order type is provided in Table 2.

There was a large and significant reduction in RAR events after the adoption of the distinct naming convention. The RAR error rate decreased from 59.5 per 100 000 orders preintervention to 37.9 per 100 000 orders postintervention, a 36.3% reduction. The OR of an RAR event post- versus preintervention was 0.64 (95% confidence interval [CI]: 0.42–0.97).

The benefits of the distinct naming convention were seen in most subgroups examined (Fig 3). The distinct naming convention had a particularly strong effect in reducing RAR events in orders placed by house staff (OR: 0.48; 95% CI: 0.24–0.93) and in orders placed on male patients (OR: 0.39; 95% CI: 0.19–0.83). ORs were not calculable for respiratory therapists and "other" providers because the respiratory therapists had no RAR events postintervention and the "other"

TABLE 1 Demographic Characteristics for the DISTINCT Study

	Total	Preintervention (July 1, 2012–June 30, 2013)	Postintervention (July 1, 2013–June 30, 2014)
Provider characteristics			
n	677	334	343
Attending, n (%)	100 (14.8)	47 (14.1)	53 (15.5)
House staff, n (%)	359 (53.0)	178 (53.3)	181 (52.8)
Nurse practitioner, n (%)	21 (3.1)	10 (3.0)	11 (3.2)
Physician assistant, n (%)	32 (4.7)	16 (4.8)	16 (4.7)
Respiratory therapist, n (%)	52 (7.7)	25 (7.5)	27 (7.9)
Other, n (%)	113 (16.7)	58 (17.4)	55 (16.0)
Patient characteristics			
n	2182	1067	1115
Male, n (%)	1200 (55.0)	607 (56.8)	593 (53.2)
Race/ethnicity, n (%)			
White	195 (8.9)	82 (7.6)	113 (10.1)
Black	682 (31.3)	348 (32.6)	334 (30.0)
Latino	601 (27.5)	308 (28.9)	293 (26.3)
Other/unknown	704 (32.3)	329 (30.8)	375 (33.6)
Insurance, n (%)			
Commercial	526 (24.1)	258 (24.2)	268 (24.0)
Medicaid	1650 (75.6)	805 (75.4)	845 (75.8)
Self-pay	6 (0.3)	4 (0.3)	2 (0.2)

providers group had no RAR events pre- or postintervention.

DISCUSSION

The implementation of a distinct naming convention for neonates requiring NICU admission resulted in a 36.3% reduction in RAR events, demonstrating that nondistinct naming conventions are associated with an increased risk of wrong-patient errors and that this risk can be reduced significantly by changing to a distinct naming convention. Our results support the hypothesis that the simple intervention of changing from a nondistinct naming convention (eg, Babygirl) to

TABLE 2 Breakdown of RAR Events by Subgroup

	Preintervention (July 1, 2012–June 30, 2013)				Postintervention (July 1, 2013–June 30, 2014)			
	Total Orders	RAR Events	RAR Events per 100 000 Orders	Wrong-Patient Orders per 100 000 Orders[a]	Total Orders	RAR Events	RAR Events per 100 000 Orders	Wrong-Patient Orders per 100 000 Orders[a]
Total	157 857	94	60	45	142 437	54	38	29
By provider type								
House staff	58 193	40	69	52	55 465	15	27	21
Nurse practitioner	44 035	30	68	52	34 009	24	71	54
Physician assistant	22 978	17	74	56	20 262	8	39	30
Attending	16 448	6	36	28	18 810	7	37	28
Respiratory therapist	13 700	1	7	6	12 634	0	0	0
Other	2503	0	0	0	1257	0	0	0
By patient type								
Male	96 070	59	61	47	75 695	23	30	23
Female	61 787	35	57	43	66 742	31	46	35
Age								
<1 day	29 530	7	24	18	34 688	7	20	15
1–3 days	30 570	12	39	30	31 669	10	32	24
4–30 days	59 904	49	82	62	47 004	21	45	34
>30 days	37 853	26	69	52	29 076	16	55	42
Race/ethnicity								
White	11 287	6	53	41	14 984	6	40	31
Black	55 998	27	48	37	45 624	12	26	20
Latino	44 392	37	83	64	26 897	15	56	42
Other/unknown	46 180	24	52	40	54 932	21	38	29
Insurance								
Commercial	36 700	24	65	50	33 275	8	24	18
Medicaid	120 954	70	58	44	109 068	46	42	32
Self-pay	203	0	0	0	94	0	0	0

[a] Based on a positive predictive value of 76.2%.[6]
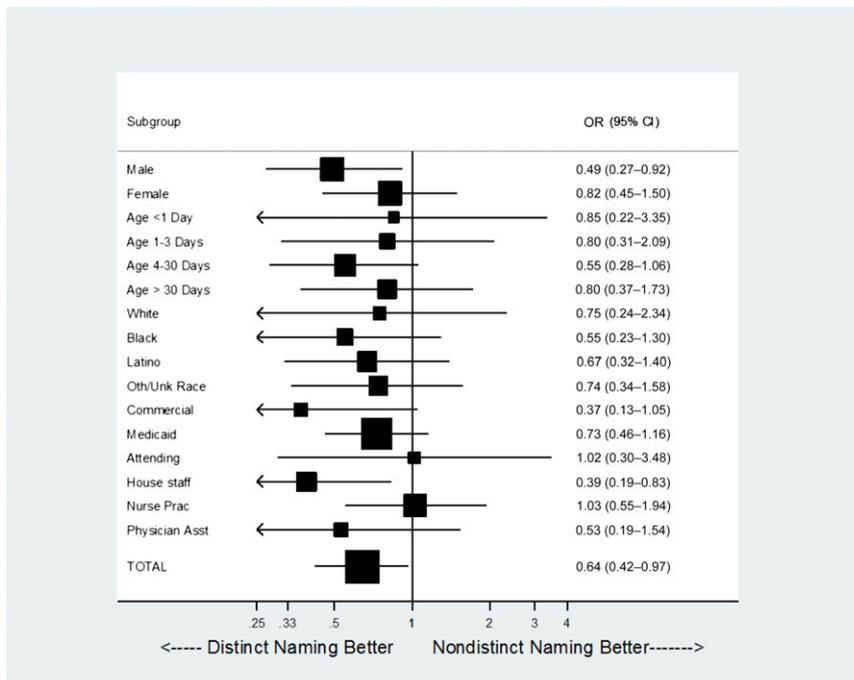
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FIGURE 3
Breakdown of ORs by subgroups. The size of the box is proportional to the number of orders. Asst, assistant; Oth/Unk, other/unknown; Prac, practitioner.

a distinct naming convention (eg, Wendysgirl) can result in a meaningful reduction in wrong-patient errors in NICUs.

A national survey conducted through the American Academy of Pediatrics Section on Perinatal Pediatrics found that 81.7% of the 339 responding NICUs reported using a nondistinct naming convention such as Babyboy or Babygirl, demonstrating the wide use of these hazardous naming conventions.[14] Changing to a more distinct naming convention has the potential to prevent wrong-patient errors in the large number of NICUs that use nondistinct naming conventions.

This study is consistent with previous work that suggests that neonates are at increased risk of errors. In a 2012 study by Levin et al,[15] a case-control experiment was conducted in a children's hospital to evaluate if certain patient characteristics are associated with an increased risk of wrong-patient errors. The researchers found the risk ratio for newborns to be 3.57 (95%

CI: 1.93–6.59) relative to patients of other ages.

Although the intervention was designed to measure wrong-patient electronic orders, there are other types of misidentification errors in NICUs that may result from the use of nondistinct first names, such as reading imaging tests or pathology specimens for the wrong patient or administering blood products to the wrong patient.[16–18] One particularly concerning wrong-patient error unique to NICUs and hospital nurseries is feeding a mother's expressed breast milk to the wrong infant.[19] The use of distinct patient names printed on breast milk bottles may also decrease the risk of a nurse removing the wrong bottle from a nursery refrigerator. Removing the hazard of similar names has the potential to reduce many types of wrong-patient errors in the NICU.

It is worth noting that the distinct naming convention was specifically designed for the NICU, as opposed to other nonspecific interventions developed for general patient

populations that may be less effective in the NICU. For example, a 2012 study by Hyman et al[20] showed that patient photographs embedded in a CPOE system is a promising strategy for reducing wrong-patient orders; however, the authors acknowledged the limitation of this intervention for newborns whose physical appearance contributes little to distinguish one infant from another. Additional strategies aimed at preventing wrong-patient orders include using electronic decision support to verify patient identification before placing orders or alerting providers when orders are not consistent with the diseases listed in the problem list.[6,21,22] However, these interventions can be costly, dependent on the type of CPOE system, and their effectiveness may diminish over time due to alert fatigue.[23] Replacing a nondistinct naming convention with one that uses distinct names is a simple and effective intervention that is not costly, labor intensive, or dependent on new technology and may be easily implemented in most NICUs.

To accelerate the adoption of distinct naming conventions, regulatory bodies such as the Joint Commission might consider prohibiting the use of nondistinct naming conventions such as Babyboy or Babygirl. In an analogous initiative, the Joint Commission required that QD (once daily), which was sometimes confused with QID (4 times per day), be replaced with DAILY to prevent errors.[24,25] Replacing nondistinct names such as Babygirl with discrete names such as Wendysgirl is a similar type of intervention.

The DISTINCT study used an established, automated tool to capture the primary outcome of RAR events. The RAR tool was developed for studying the effect of interventions on wrong-patient electronic orders. In a validation study conducted in a hospital setting that included, but was not limited to,

the NICU, the RAR tool was found to have a positive predictive value for wrong patient errors of 76.2%.[6] The RAR tool, therefore, slightly over-identifies wrong-patient errors by including some false-positives. For example, a false-positive RAR event might occur during total parenteral nutrition (TPN) rounds in the NICU, when a provider cancels a TPN order for a reason other than a wrong-patient error and then writes a parenteral nutrition order for the next patient in need of TPN.

The benefits of the distinct naming convention were particularly pronounced in orders placed by house staff and in orders placed on male patients (Fig 3). A larger study that allows for precise subanalysis may determine if certain provider types and patients are more or less impacted by this intervention.

In NICUs with nondiscrete naming conventions, multiples may have an increased risk of wrong-patient errors as a result of the near identical names of siblings (eg, BabyboyA Smith and BabyboyB Smith). However, we were not able to test this hypothesis or evaluate the effectiveness of the DISTINCT intervention specifically in multiples for 2 reasons: (1) we were unable to differentiate unrelated singletons with the same last name from multiples in our preintervention data set and (2) we did not have sufficient power to detect differences between

subgroups. Further research is needed to determine if multiples have higher wrong-patient error rates compared with singletons and to assess the effect of the DISTINCT intervention on preventing wrong-patient errors in this subgroup of patients.

An alternate approach for replacing nondistinct naming conventions is to change newborns' temporary names to their given names as soon as they are available. We explored implementing this solution but were deterred by the technical obstacle of reconciling 2 different names for 1 patient in the middle of an admission. This solution warrants further exploration.

This study has several limitations. First, the intervention study used historical controls and a secular trend might confound the results. Second, it was not possible to blind the ordering providers to the naming convention change, and thus providers may have improved their behavior in response to their awareness of being observed (ie, the Hawthorne effect). A longer study is needed to assess if the Hawthorne effect confounded our results. Third, the positive predictive value of 76.2% for the RAR tool was determined by using patients from a hospital setting across multiple units and was not specific to the NICU. Additional research validating the RAR tool specifically in the NICU is warranted. Finally, the study was

not powered for subanalyses to identify high-risk subgroups, nor to evaluate the effect of the DISTINCT intervention on any identified high-risk subgroups.

CONCLUSIONS

Our findings suggest that the use of nondistinct, temporary first names for newborns is hazardous and that replacing a nondistinct, temporary naming convention with one that is more distinct may significantly reduce wrong-patient errors in the NICU.

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ABBREVIATIONS

CI: confidence interval
CPOE: computerized provider order entry
DISTINCT: Distinct Naming Convention Trial
OR: odds ratio
RAR: Retract-and-Reorder
TPN: total parenteral nutrition

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