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# Evaluation of Intervention Aimed at Reducing Alteplase Returns Without Compromising Clinical Care in Acute Ischemic Stroke

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## Background / Objective

- In 2010, the AHA/ASA's Target Stroke best practice recommendations to reduce door to needle times (DTN) included early pre-mix of intravenous alteplase.
- Early premixing of alteplase has led to unused vials. The price for replacement vials range from \$6,400 to \$8,400 per 100mg vial. However, hospitals have largely recouped the cost of wasted alteplase by returning them to the drug manufacture for free replacement vials.
- Our Primary Stroke Center (PSC) had a high return rate prompting our team to implement interventions aimed at ethical stewardship of resources without compromising clinical care.
- Objective:** Evaluate whether specific interventions reduced clinical expenses without affecting timeliness of clinical care at our PSC

## Methods

- The following intervention was implemented between July–Sept 2015:
  - Establishing a dedicated pharmacist in the ED to mix alteplase at bedside Friday–Tuesday, 12:30–21:00, in addition to existing satellite pharmacy available all other times
  - Implementing single call number from neurology to pharmacist to initiate treatment
  - Educating neurologist on current alteplase waste and cost per vial
- Clinical data were from the American Stroke Association's Get with the Guidelines database; alteplase vial usage was from the pharmacy's internal quality tracking database
- Data from Acute Ischemic Stroke (AIS) patients presenting at our PSC emergency room within 4.5 hours of Last Known Well (LKW) and treated with IV-alteplase between Jan–June 2015 & Sept–Nov 2016 were included
- Exclusions: inpatient strokes or those with diagnoses unrelated to stroke; alteplase mixes during the implementation phase (July–August, 2015)
- Pre-intervention cases (Jan–June 2015) were compared to post-intervention cases (Sept 2015–Nov 2016)
- Primary outcomes:**
  - Change in % returned vials (total vials returned/total vials mixed) between pre- and post-intervention time periods
  - Expected number of post-intervention vials that would have been returned using pre-intervention percent returned was calculated to assess costs
  - Costs were derived using the number of expected returned vials vs actual number of returned vials (cost = # of vials \* cost/vial). Costs were estimated as a range between \$6400–\$8400 per returned 100mg vial. Cost Savings = 'expected' minus 'actual' returns for the post-intervention time period
- Secondary outcomes:** median DTN and median pharmacy go-ahead call time to needle time (GoTN); Mann-Whitney test was used to compare DTN and GoTN between pre and post- intervention time periods
- A sub-analysis of patients treated during the post-intervention time period was used to determine whether GoTN or DTN differed depending on location of alteplase mixing (satellite pharmacy vs ED bedside); Mann-Whitney tests were used to determine differences.

## Results

- Data from 126 alteplase administered AIS patients were included
- Pre-intervention alteplase returns was 39.5% (15/38) versus 11.3% (10/88) post-intervention (Table 1)
- Post-intervention, the observed number of returned vials was lower than expected (10 vs 35) (Table 1)
- Pre-intervention expected cost of returned vials ranged from \$96,000–\$126,000, post-intervention expected cost was \$76,800–\$100,800, equaling cost-savings of \$166,400–\$218,400 (Table 1)

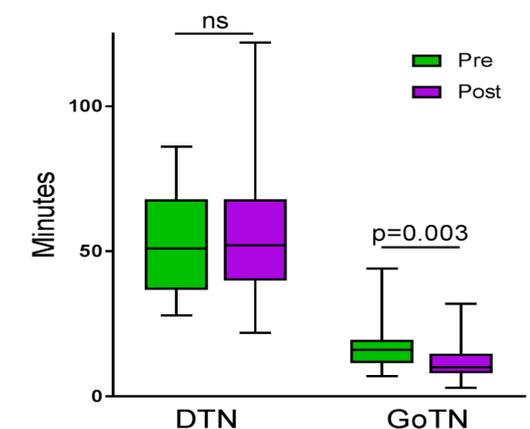
- DTN was not significantly different post- vs pre-intervention (median [IQR]=51.0 min [36.8,68.0] vs 52.0 min [40.0,68.0]; p=0.966) (Figure 1).
- GoTN was significantly faster post- vs pre-intervention (median [IQR]=10.0 min. [8.0,14.8] vs 16.0 min. [11.5,19.5]; p=.011) (Figure 1).
- Sub-analysis among post-intervention cases found that DTN and GoTN were not significantly different when pharmacy mixed alteplase in the ED compared to the satellite pharmacy (median DTN [IQR]=45.0 min [35.0, 68.0] vs. 53.0 min [42.0, 68.0]; p=0.701) & median GoTN [IQR]=8.00 min [6.0, 13.0] vs. 11.00 min [9.0,14.75], respectively.

Table 1. Cost Savings in the Post-Intervention Time Period.

Pre and Post Intervention Returns		
	Pre-Intervention	Post-Intervention
Number of alteplase mixes	38	88
Number of alteplase returns	15	10
Percent Returned	39.5%	11.3%
Post-Intervention Expected Vs. Actual Returns		
	Expected Number of Returns Using Pre-Intervention Percent Returned of 39.5% <sup>a</sup>	Actual Returns <sup>b</sup>
Number of Vials	35	10
Post-Intervention Cost & Cost Savings Based on Expected vs. Actual Returns		
Total minimum cost <sup>c</sup> , in \$	224,000	57,600
<b>Minimum savings, in \$</b>	<b>166,400</b>	
Total maximum cost <sup>d</sup> , in \$	294,000	75,600
<b>Maximum savings, in \$</b>	<b>218,400</b>	

<sup>a</sup> Calculation based on 88 post-intervention mixes.  
<sup>b</sup> Actual number of mixes returned in post-intervention time period.  
<sup>c</sup> Minimum Cost = number of mixes returned\*minimum cost per mix, \$6,400/vial  
<sup>d</sup> Maximum Cost = number of mixes returned\*maximum cost per mix, \$8,400/vial

Figure 1. Decrease in GoTN Times from Pre to Post-Intervention while DTN Times Remained the Same.



## Conclusions

- Percentage of vials returned decreased substantially following the intervention and resulted in extensive cost savings
- PSCs can reduce overall waste of alteplase and decrease costs without negatively effecting clinical care
- Stroke programs need to stay aware of both the increasing costs of alteplase and changes in replacement policies, including the November 2016 change from 6 months to 30 days with a physician or pharmacy director signature required for reimbursement
- Continued research is needed to assess the impact of other interventions aimed at reducing DTN times in the ED and its effect on alteplase waste

## References

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