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## Descriptive Analysis of Patients Managed with Anticoagulation Therapy

Janet L. Ruffin, MSN, RN, Kathie S. Zimbrow, PhD, RN, Mary M. Morin, MSN, RN  
Gabrielle D’Lima, PhD, & Patricia Ver Schneider, Sr IAS



### Background

- Warfarin is one of the most common medications implicated in hospitalizations of the elderly. There are approximately 100,000 emergency hospitalizations each year as a result of adverse drug events from warfarin. Half of these admissions are for patients over the age of 80.<sup>1</sup>
- Warfarin presents significant risks due to the small therapeutic range for this drug to be effective. Sub-therapeutic levels can result in a deep vein thrombosis (DVT), pulmonary emboli (PE), or stroke. Supratherapeutic levels can cause a cerebral bleed or even death.
- There are many potential factors that affect the blood levels of warfarin therapy. These factors include diet, co-morbid conditions, adherence to medication schedule and obesity.<sup>2</sup>
- It is unknown whether an nurse-pharmacist managed anticoagulation clinic (AC) will improve outcomes for patients receiving long term anticoagulation therapy in the outpatient setting.

### Significance

- Warfarin therapy is challenging due to the narrow therapeutic window in order to keep the patients in therapeutic range.<sup>3</sup> Subtherapeutic values can cause the patient to develop DVT’s and PE’s, supratherapeutic and the patient may experience a cerebral hemorrhage.
- Evidence-based anticoagulation therapy protocol implementation has been shown to improve the TTR for the patients and reduce their potential for adverse events.<sup>4</sup>
- This project is an opportunity to improve the anticoagulation therapy management by enhancing clinical performance and improving quality outcomes for patients.

### Objectives and Research Questions

This study aimed to evaluate the efficacy of a nurse-pharmacist managed anticoagulation clinic. The research question included:

- In patients requiring warfarin for anticoagulation, is there a difference between the nurse-pharmacist dyad medication management compared with the physician medication management process on the TTR?

### Statistical Analyses

Table 1. Study Variables by Intervention Period for Independent Samples										
	Intervention Period						Median Difference Analysis		Mann-Whitney U Analysis	
	Standard Care (n= 1046)			Nurse-Pharmacist Dyad Care (n=1685)						
	M(SD)	Mdn [25%, 75%]	Min, Max	M (SD)	Mdn [25%, 75%]	Min, Max				
Total Days (First through Last INR)	107.80 [100.12]	70.03 [21.37, 183.40]	0.16, 362.32	145.91 [108.10]	133.92 [38.86, 247.02]	0.00, 364.16				
Days In Control (%)	33.86 [33.40]	20.60 [6.55, 52.69]	0.00, 100	44.99 [33.48]	38.52 [15.67, 70.72]	0.00, 100	91.96	<.001	9.53	<.001
Days Out of Control (%)	33.19 [28.84]	27.30 [5.47, 55.33]	0.00, 99.03	24.97 [25.90]	17.49 [00.88, 40.06]	0.00, 100				
Days Not Included (%)	32.94 [27.52]	27.73 [8.79, 51.54]	0.00, 98.69	30.04 [23.45]	28.06 [10.06, 45.27]	0.00, 98.71				
First In Control Range										
Days Until First In Control Range	24.74 [48.67]	3.52 [0.00, 26.40]	0.00, 330.74	23.22 [45.31]	1.76 [0.00, 24.67]	0.00, 322.84	3.93	0.047	-1.57	0.117
Days Within 1st In Control Range	17.93 [33.15]	3.52 [1.05, 21.02]	0.01, 279.99	34.44 [50.01]	14.09 [2.08, 42.00]	0.00, 356.47	127.50	<.001	11.19	<.001
Total Ranges	3.95 [3.06]	3.00 [2.00, 5.00]	1.00, 30.00	3.77 [2.68]	3.00 [2.00, 5.00]	1.00, 20.00				
Ranges In Control (%)	53.33 [23.68]	50.00 [33.33, 61.78]	10.00, 100.00	60.21 [25.72]	50.00 [40.00, 80.00]	14.28, 100.00	55.58	<.001	7.08	<.001
Ranges Out of Control (%)	46.67 [23.68]	50.00 [38.22, 66.67]	0.00, 90.00	39.79 [25.72]	50.00 [20.00, 60.00]	0.00, 85.71				
Total Tests	15.85 [15.56]	11.50 [7.00, 19.00]	2.00, 153.00	14.29 [11.96]	11.00 [6.00, 18.00]	2.00, 87.00				
Tests In Control (%)	47.91 [28.36]	40.00 [25.00, 64.28]	4.17, 100	57.70 [30.09]	52.00 [32.00, 87.88]	4.17, 100	70.66	<.001	8.35	<.001
Tests Out of Control (%)	52.09 [28.36]	60.00 [35.71, 75.00]	0.00, 95.83	42.30 [30.09]	48.00 [12.12, 68.00]	0.00, 95.83				
Tests Not Included (%)	19.46 [17.15]	15.79 [6.67, 28.57]	00.00, 85.00	22.42 [17.35]	20.00 [10.00, 33.33]	-75.00, 87.00				

Table 2. Study Variables by Intervention Period for Dependent Samples Without Ranges that Cross										
	Intervention Period						Friedman's ANOVA		Wicoxon Signed Rank Test	
	Standard Care (n= 1240)			Nurse-Pharmacist Dyad Care (n=1240)						
	M(SD)	Mdn [25%, 75%]	Min, Max	M (SD)	Mdn [25%, 75%]	Min, Max				
Total Days (First through Last INR)	218.99 [119.08]	260.11 [118.67, 322.00]	0.00, 363.33	238.76 [106.70]	279.04 [168.52, 325.93]	02.01, 363.94				
Days In Control (%)	49.14 [30.89]	45.66 [24.24, 72.20]	0.00, 100	39.77 [28.33]	39.77 [23.11, 62.38]	0.00, 100	12.77	<.001	-4.83	<0.001
Days Out of Control (%)	16.73 [19.30]	10.22 [0.00, 25.07]	0.00, 97.25	18.79 [19.02]	14.22 [02.95, 28.12]	0.00, 95.39				
Days Not Included (%)	34.13 [23.94]	33.77 [16.47, 49.15]	0.00, 99.00	36.71 [21.55]	37.60 [21.88, 50.87]	0.00, 99.00				
First In Control Range										
Days Until First In Control Range	23.33 [50.25]	0.00 [0.00, 21.00]	0.00, 315.87	28.65 [52.43]	0.00 [0.00, 37.12]	0.00, 343.88	13.2	<0.001	3.89	<0.001
Days Within 1st In Control Range	52.29 [66.61]	28.04 [6.99, 69.02]	0.00, 350.09	51.98 [61.67]	29.25 [13.96, 63.05]	0.00, 353.29	1.78	0.182	0.98	0.327
Total Ranges	4.08 [2.95]	3.00 [2.00, 5.00]	1.00, 26.00	4.65 [3.26]	4.00 [3.00, 6.00]	1.00, 32.00				
Ranges In Control (%)	64.28 [24.86]	60.00 [50.00, 100.00]	16.67, 100.00	59.98 [23.76]	53.33 [41.67, 75.00]	12.50, 100.00	11.19	<.001	-4.72	<.001
Ranges Out of Control (%)	35.72 [24.86]	40.00 [00.00, 50.00]	0.00, 83.00	46.67 [23.76]	46.67 [25.00, 58.33]	0.00, 87.50				
Total Tests	14.72 [13.22]	12.00 [8.00, 17.00]	2.00, 183.00	16.47 [15.62]	13.00 [9.00, 19.00]	2.00, 162.00				
Tests In Control (%)	64.14 [27.81]	63.64 [40.70, 100.00]	6.67, 100.00	59.76 [26.87]	57.14 [38.89, 81.82]	6.45, 100.00	24.13	<.001	-4.68	<.001
Tests Out of Control (%)	35.86 [27.81]	36.36 [00.00, 59.30]	0.00, 93.33	42.86 [26.87]	42.86 [18.18, 61.11]	0.00, 93.54				
Tests Not Included (%)	22.79 [15.75]	21.05 [11.76, 31.25]	0.00, 82.00	24.68 [15.07]	22.22 [14.29, 33.33]	0.00, 85.00				

Table 3. Study Variables by Intervention Period for Dependent Samples With Ranges that Cross										
	Intervention Period						Friedman's ANOVA		Wicoxon Signed Rank Test	
	Standard Care (n= 1037)			Nurse-Pharmacist Dyad Care (n=1037)						
	M(SD)	Mdn [25%, 75%]	Min, Max	M (SD)	Mdn [25%, 75%]	Min, Max				
Total Days (First through Last INR)	223.31 [84.82]	242.91 [174.88, 293.00]	0.92, 356.87	224.99 [86.36]	243.99 [169.15, 294.30]	1.95, 363.97				
Days In Control (%)	50.21 [28.01]	47.84 [28.46, 70.54]	0.11, 100	48.22 [27.02]	45.13 [26.90, 68.16]	0.19, 100	5.54	0.019	-2.06	0.04
Days Out of Control (%)	17.01 [18.22]	12.35 [1.17, 12.35]	0.00, 96.41	17.68 [16.94]	14.47 [03.14, 26.97]	0.00, 88.95				
Days Not Included (%)	32.78 [19.99]	32.78 [18.59, 46.65]	0.00, 96.00	34.10 [19.90]	34.65 [20.45, 47.85]	0.00, 97.00				
First In Control Range										
Days Until First In Control Range	19.94 [41.42]	0.00 [0.00, 21.05]	0.00, 308.72	26.18 [45.02]	0.00 [0.00, 36.86]	0.00, 283.91	10.65	<.001	4.02	<.001
Days Within 1st In Control Range	62.60 [62.93]	40.95 [18.94, 84.21]	0.044, 309.72	55.38 [56.41]	34.22 [15.00, 76.35]	0.12, 329.00	4.59	0.032	-2.96	0.003
Total Ranges	4.08 [3.03]	3.00 [2.00, 5.00]	1.00, 26.00	4.28 [3.04]	4.00 [2.00, 5.00]	1.00, 30.00				
Ranges In Control (%)	63.15 [24.02]	57.14 [50.00, 80.00]	20.00, 100.00	61.08 [23.11]	57.14 [50.00, 75.00]	14.29, 100.00	2.23	0.127	-2.05	0.4
Ranges Out of Control (%)	36.85 [24.02]	42.86 [20.00, 50.00]	0.00, 80.00	38.92 [23.11]	42.86 [25.00, 50.00]	0.00, 85.71				
Total Tests	14.62 [13.41]	11.00 [8.00, 16.50]	2.00, 169.00	14.70 [12.14]	11.00 [8.00, 17.00]	2.00, 110.00				
Tests In Control (%)	64.16 [26.45]	63.64 [42.86, 85.71]	5.56, 100	62.23 [25.19]	60.00 [42.86, 80.00]	6.90, 100.00	2.23	0.136	-1.88	0.061
Tests Out of Control (%)	35.84 [26.45]	36.36 [14.29, 57.14]	0.00, 94.44	37.77 [25.19]	40.00 [20.00, 57.14]	0.00, 93.10				
Tests Not Included (%)	22.58 [13.91]	20.00 [12.50, 29.71]	0.00, 71.00	22.74 [13.80]	21.05 [12.50, 31.25]	0.00, 75.00				

### Methods

- A retrospective cohort study was used to extract medical record data from patient (N=????) EMR’s between April 2012 and April 2014. Patient demographic (age and gender) and quality measures for anticoagulation therapy were analyzed (time and percent in therapeutic range (TTR)).
  - Three comparison groups: 1) Independent samples consisting of patients with INR results for only the standard care period (n=1046) or the nurse-pharmacist dyad (n=1685); 2) Dependent samples (N = 1240) including patients with INRs in both study periods without ranges crossing between periods; and 3) Dependent samples (N = 1037) including patients with INRs in both study periods with ranges crossing between periods.
  - Sample: Female/Male: 44.8%/55.2%; Median age 72.30 years (SD=12.36) at start of study, (Range=19.0 to 106 years).
  - Median and Mann-Whitney U tests were conducted on the independent samples to compare for differences in medians and distributions, respectively. Friedman’s Analysis of Variance (ANOVA) and Wilcoxon Signed Rank tests were used to compare dependent samples for differences in medians and distributions, respectively.
- ### Results
- The independent samples comparisons demonstrated the nurse-pharmacist dyad care evidenced significantly higher percentage of days, ranges, and tests within the appropriate INR range as well as the number of days See Table 1 for descriptives.
  - Dependent Sample (Without Ranges that Cross) demonstrated the nurse-pharmacist dyad care evidenced significantly higher percentage in days, ranges and tests. Days not significantly higher. See Table 2 for descriptives.
  - Dependent Sample (With Ranges that Cross) demonstrated the nurse-pharmacist dyad care evidenced significantly higher percentage in days and ranges. Percentage of tests not significantly higher. See Table 3 for descriptives.

### Conclusions and Implications

- Nurse-pharmacist dyad for anticoagulation care is significantly improved in the independent sample comparison (table 1).
- Further analysis needs to be completed with the nurse-pharmacist dyad in place for one year to validate continued improvement in the time and percentage of INR values.
- The overall percentage of days, test and ranges in control in all three comparisons has room for improvement using evidence-based literature for improved patient outcomes.

### Contact Information

Janet Ruffin, MSN, RN (jlrruffin@sentara.com)

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