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Incidence of Deep Vein Thrombosis in Patients Undergoing Right Internal Jugular Vein Cannulation for Veno-Venous Extracorporeal Membrane Oxygenation

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BACKGROUND

- Veno-Venous Extracorporeal Membrane Oxygenation (VV ECMO) has been used more frequently for adult patients experiencing respiratory failure over the past decade. Using dual lumen cannulas through the internal jugular vein (IJV) has revolutionized another field (Fig 1). However, because of RIJ cannulation, there may be an increased incidence of right IJ DVT which result negatively for central IV access and thromboembolism in these sick patients.

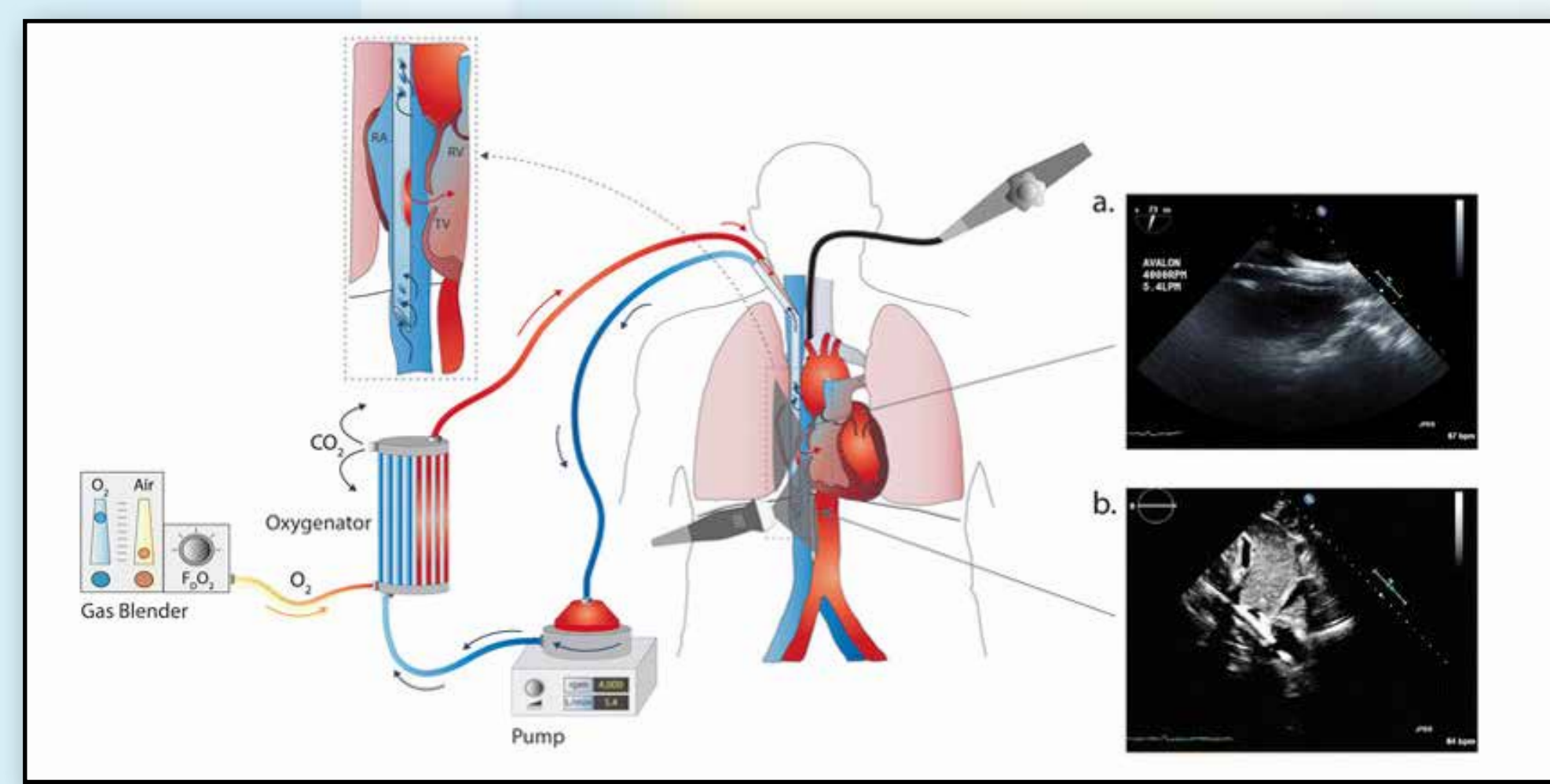


Figure 1: RIJ Cannulation for VV ECMO

A double-lumen cannula is placed through the RIJ into the right atrium (RA). Desaturated blood is withdrawn from the RA and moves to a pump which pushes this blood to an oxygenator where O₂ will be added and CO₂ will be removed. The blood is then rewarmed through a heat exchanger and is returned through the inner lumen of the catheter across the tricuspid valve so the heart can pump the blood to the rest of the body.

OBJECTIVE

- Study seeks to find the incidence of RIJ DVT in patients whom were weaned off VV-ECMO
- Determine whether correlations between incidences exist

METHODS

- A retrospective study that reviewed all VV-ECMO patients recorded from 2013 - 2016 at the Lehigh Valley Health Network through the in-house database and EHR
 - Vas Venous Duplex Upper Extremity Bilateral images were analyzed to indicate the presence of DVT

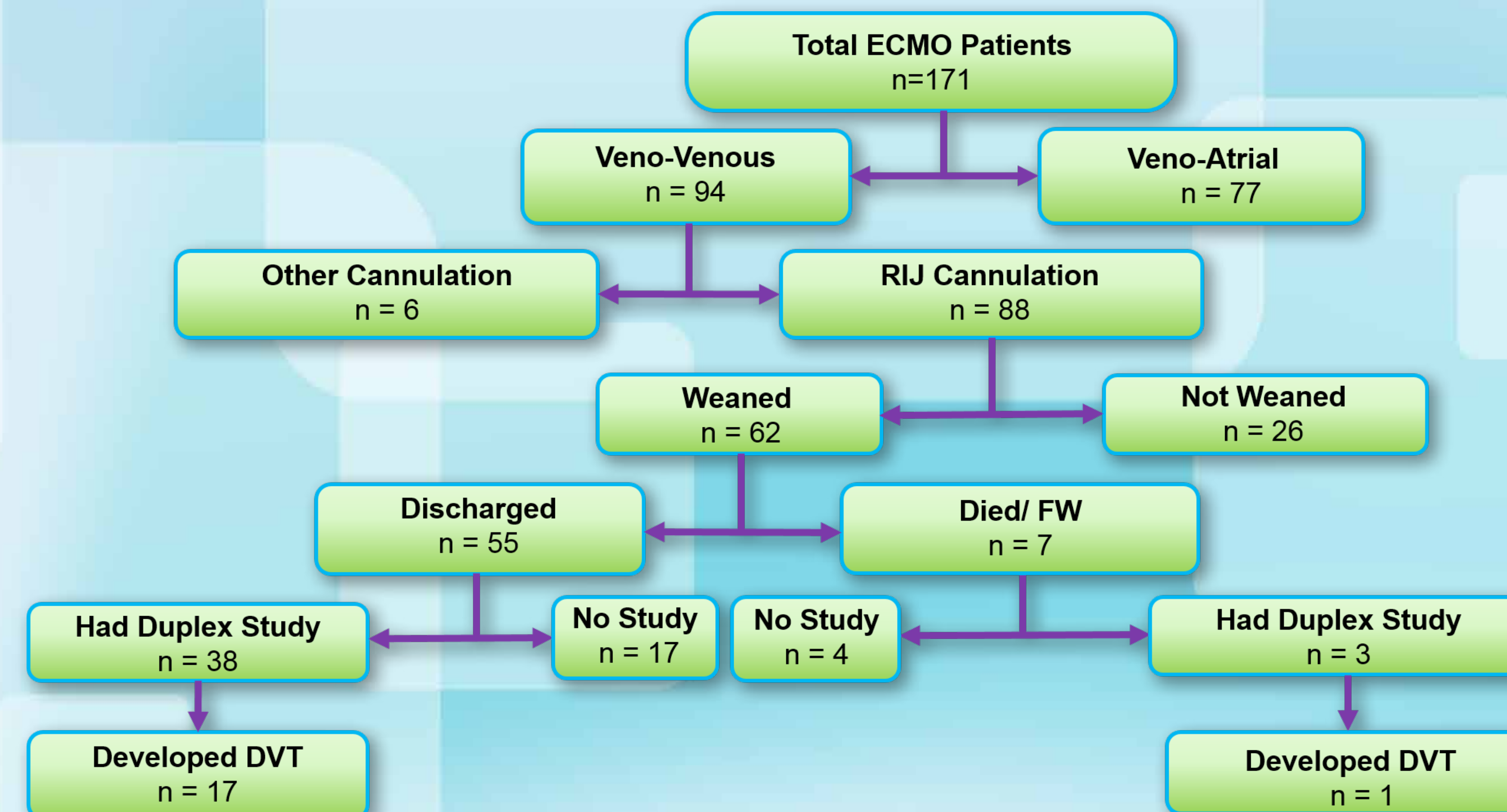


Figure 2: Flow chart of population of interest

Of the 171 ECMO patients, 88 underwent RIJ Cannulation for VV- ECMO. However, only 41 patients eventually received the duplex study to evaluate the presence of DVT in the RIJ.



Figure 3: Upper extremity venous duplex studies of the patients who were weaned off RIJ VV Canulation

From the population at interest, the left most image is of a patient who did not develop a DVT. The middle image represent a patient who experienced and occlusive DVT in the RIJ and the right most figure is that of a non-occlusive RIJ DVT. Of the DVT's developed 55.5% were occlusive and 44.5% were non-occlusive.

Table 1. Summary of DVT Incidences for Independent Variables

Category	Num. of Patients	Num. of DVT	Percent DVT	Z-score	Probability
Total Population	41	18	43.90243902	N/A	N/A
Total Male (M)	19	10	52.63157895	1.05	0.8531
Total Female (F)	22	8	36.36363636		
Population 50 and older	19	11	57.89473684	1.68	0.9535
Population under 50	22	7	31.81818182		
Male ≥ 50 yrs old	8	6	75	1.67	0.9525
Male < 50 yrs old	11	4	36.36363636		
Female ≥ 50	11	5	45.45454545	0.89	0.8133
Female < 50	11	3	27.272727		
On ECMO ≥ 7 days	31	16	51.61290323	1.75	0.9599
On ECMO < 7 days	10	2	20		
Male on ECMO ≥ 7 and over 50	5	5	100	2.08	0.9812
Female on ECMO ≥ 7 and over 50	11	5	45.45454545		

Values of > 0.95 illustrates that the results are significant at the 0.05 level. Thus, we would be 95% sure that the results produced are statistically significant and that if the trails were to run under the same conditions, similar results would be produced.

RESULTS

- 75% of Males ≥ 50 developed DVT (0.05 level of significance)
- 45.4% of Females ≥ 50 developed a DVT (0.2 level)
 - More significant for males—lower # of endothelial progenitor cells, and increase in IJV cross sectional area
- 51.6% of patients treated ≥ 7 days developed DVT (.05 level)
 - Long periods of immobility cause improper blood flow
- ½ of females and all males ≥ 50 and on ECMO for ≥ 7 days had DVT (0.02 level of significance)

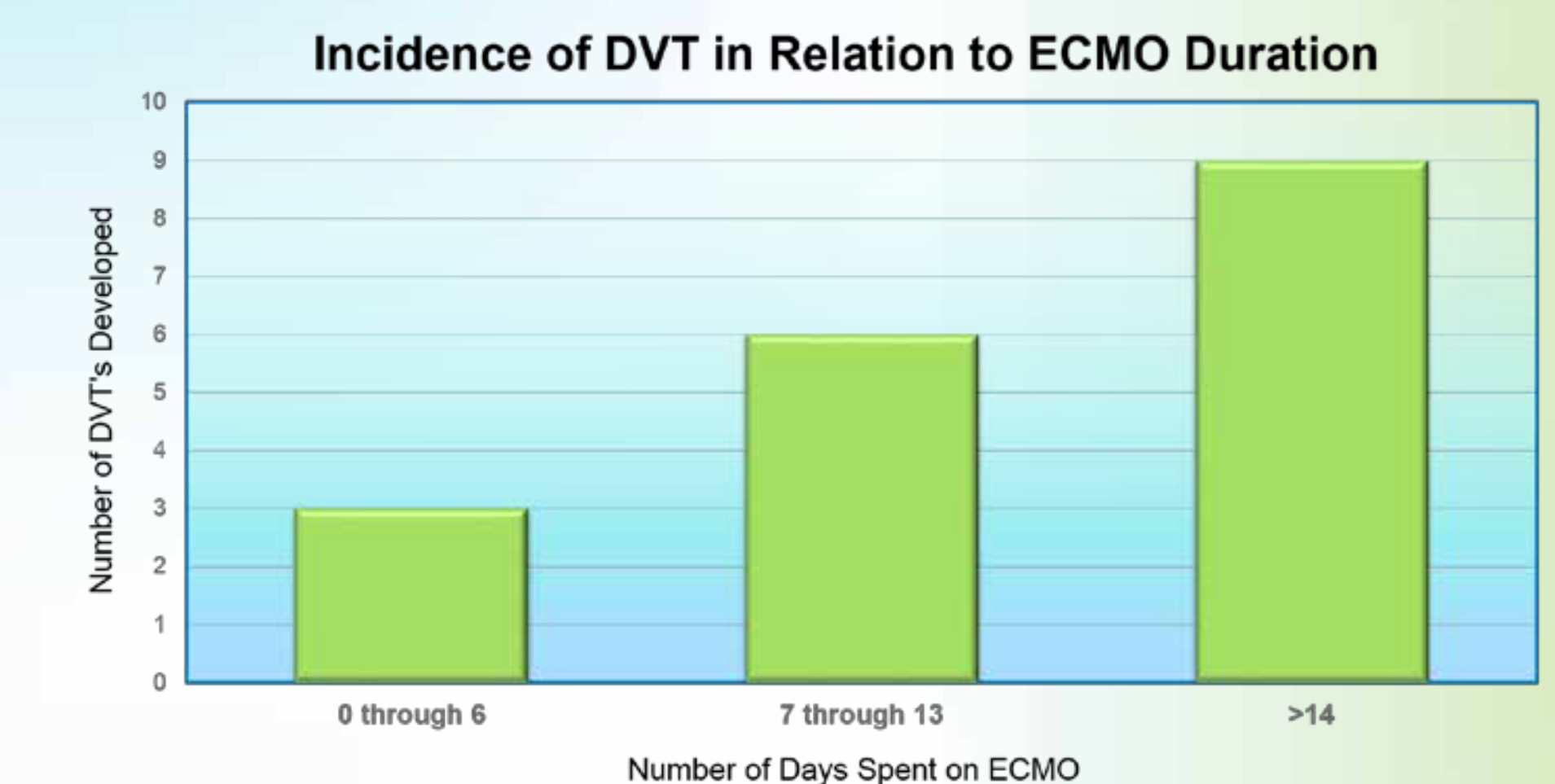


Figure 4: Number of DVT during certain intervals of time on ECMO

Prior to 7 days, there had only been three incidence of DVT which then doubles if you look at the interval of 7 to 14 days. This pattern that incidence increases with duration of treatment and further illustrated by the increase of incidence once a patient has been on ECMO for over 14 days.

CONCLUSIONS

- Large bore cannulation to the RIJ resulting in DVT is observed in less than half of patients. Of those observed, the majority were occlusive. For males age ≥ 50, and an increased duration on ECMO increases the incidence.

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