Impact of Therapeutic Inertia on Healthcare Outcomes for Patients with Type 2 Diabetes Mellitus

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Introduction

- Therapeutic inertia, or clinical inertia, is defined as "the failure of health-care providers to initiate or intensify therapy when therapeutic goals are not reached."[1] American Diabetes Association (ADA) guidelines suggest reevaluating therapy every 3-6 months to avoid therapeutic inertia.[2]
- Studies have shown significant increase in macrovascular complications including MI (67% increase), heart failure (64%), stroke (51%) and CV events (62%) in patients who had a delay in intensification with OADs (oral anti-diabetics) or insulin for more than 1 year. [2]
- Median time to initiate insulin among 15,000 patients prescribed multiple oral agents was 7.7 years despite a mean A1C >8.0% and patients being on two or more oral antihyperglycemic agents.[3]
- Few to no studies have compared insulin initiation delay times with their associated effect on medical complications and healthcare costs.

Objectives

- Determine the effects of delaying the start of insulin for patients with type 2 diabetes mellitus (T2DM), in regard to healthcare costs and hospitalization for new vascular complications.

Methods

- Retrospective review of claims data from the OPTUM database.
- Inclusion Criteria
  - OAD patients who have an A1C > 10% at any time in their claims record
  - Must have second episode which includes insulin
  - Claims data at least one year prior and two years post insulin initiation
- Tracked when the patient is indicated to start insulin and the time until its eventual initiation.
- The delay in insulin therapy is measured as the time between the first A1c >10 and the start of insulin
- Patients were grouped by months of delay up to 2 years to compare outcomes.
- Costs were measured over the 2 years following both the patient's first A1c >10 and the initiation of insulin therapy
- Differences in healthcare costs and the risk of developing vascular complications were compared across patients depending on their delay category.
- Cox hazard models were run to determine the relationship between the delay and the hospitalization
- Ordinary least squares (OLS) models were run to examine healthcare costs.
- Primary outcomes included hospital admissions for new microvascular or macrovascular complications and changes in total healthcare cost (medical + prescription) from baseline.

Results

Figure 1: Selection of Study Population

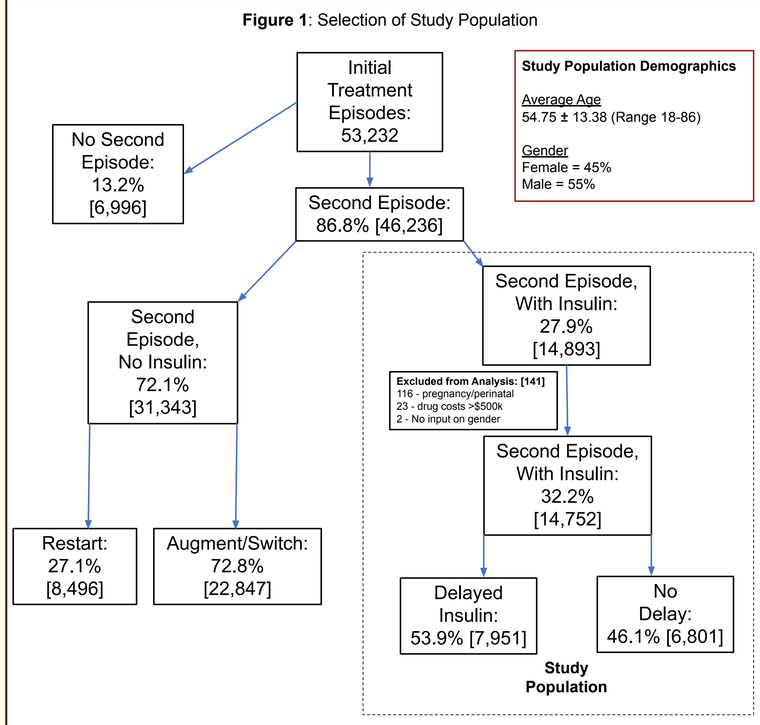

Figure 2: Increase in Risk of Hospitalization versus Duration of Insulin Delay

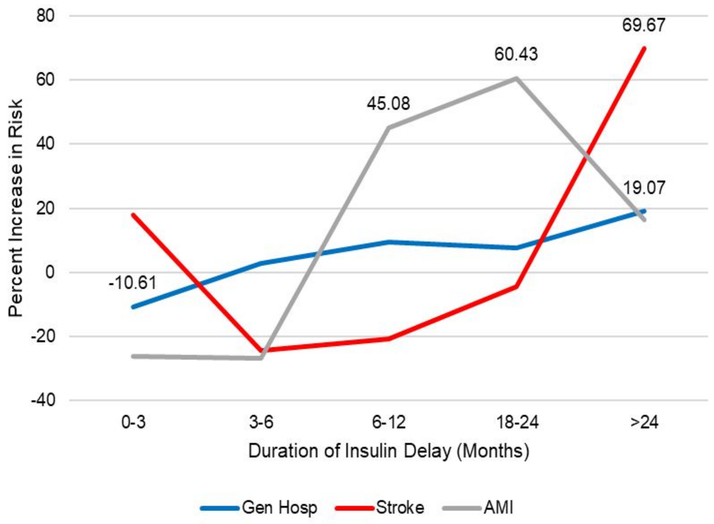

Table 1: Change in Healthcare Costs (Rx + Medical)

	Cost 1st year post A1c >10	Cost 2nd year post A1c > 10	Cost 1 year post starting insulin	Cost 2nd year post starting insulin
No Delay	Reference Group			
3-6	**$20,598*** **	**$16,095*** **	$1,961	- $118
6-12	**$28,503*** **	**$20,105*** **	**$4,246*** **	$3548
12-18	**$36,957*** **	**$25,751*** **	**$4,258** **	$3579
18-24	**$44,160*** **	**$32,292*** **	**$5,556** **	$5422
> 24	**$61,975*** **	**$49,159*** **	**$5,389*** **	$2672

Table 2: Risk of Hospitalization for Acute Myocardial Infarction

Delay Time (months)	Hazard Ratio	z	P > /z/
3-6	0.74	-1.19	0.233
6-12	0.73	-1.39	0.164
12-18	**1.45**	**1.9**	**0.058***
18-24	**1.60**	**2.3**	**0.021*** **
>24	1.16	1	0.320

Table 3: Risk of General Hospitalization

Delay Time (months)	Hazard Ratio	z	P > /z/
3-6	**0.89**	**-1.87**	**0.062***
6-12	1.03	0.55	0.584
12-18	1.09	1.54	0.123
18-24	1.08	1.16	0.245
>24	**1.19**	**4.50**	**0.000*** **

Table 4: Risk of Hospitalization for Stroke

Delay Time (months)	Hazard Ratio	z	P > /z/
3-6	1.18	0.73	0.465
6-12	0.76	-1.22	0.222
12-18	0.79	-0.83	0.408
18-24	0.95	3.62	0.865
>24	**1.70**	**10.96**	**0.000*** **

= Statistically Significant

*** = p<0.01
** = p<0.05
* = p<0.1

Results and Discussion

- The cost in the first-year post-insulin initiation is significantly higher for patients who delay relative to patients with no delay in treatment. This suggests that delaying insulin initiation possibly led to the development of more diabetes-related complications which added to the prescription and the medical costs incurred by the patient. (Table 1)
- Delaying insulin therapy following the patients initial A1c > 10 increases the risk of hospitalization, primarily due to increase in risk of stroke and AMI (Figure 2, Tables 1,2,4). This increase in the risk of hospitalization impacts the cost of treating the patient in the two years following their initial A1c > 10 relative to patients who start insulin within 3 months. These cost differentials increase monotonically with the length of delay.
- When compared to patients who did not delay insulin when indicated to start, the patients that delayed initiation for 12-18 months experienced 45% increase in hospitalizations for acute myocardial infarction (AMI), while those that delayed 18-24 months experienced a 60% increase.
- Risk of general hospitalization decreases by 11% when delaying insulin initiation for 3-6 months. This decrease may suggest that the patients with preexisting comorbidities are the ones who are delaying insulin the shortest amount of time (Table 3)
- Patients that delayed initiation for more than 24 months all had a 19% increase in general hospitalizations (Table 3)
- Additionally, patients that delayed for more than 24 months experienced a 70% increase in hospitalizations for stroke. (Table 4)
- The statistical models for CKD, nephropathy, and neuropathy showed no significant correlation between risk of disease-specific hospitalization and length of insulin delay due to the low number of hospitalizations associated with these disease states.

Conclusion

- Delaying insulin therapy once the patient's A1c exceeds 10% increases costs and has a significant negative impact on the patient's risk of stroke and AMI. Moreover, these detrimental effects increase the longer the patient delays insulin treatment.

References

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