

# Titrating Injectables



It doesn't matter where we start

**Dr Hamish Russell**

Commenced on Byetta and titrated to 10mcg bd over a 6 weeks

HbA1c 6.7%	Self - monitored blood glucose (mmol/L)								Comments
	Breakfast		Lunch		Dinner		Before Bed	Overnight	
	Before	After	Before	After	Before	After			
Day 1	5.6	6.2	5.6	7.2	6.7	8.1	7.4		
Day 2	6.2	7.8	6.7	8.3	7.1	8.7	7.3		
Day 3	6.6	7.3	6.4	8.5	6.8	8.0	7.4		

**It's been 3 years since we started byetta 10 mcg bd...**

HbA1c 8.1%	Self - monitored blood glucose (mmol/L)							Before Bed	Overnight	Comments
	Breakfast		Lunch		Dinner					
	Before	After	Before	After	Before	After				
Day 1	9.1	9.2	7.8	9.8	9.5	11.1	9.3			
Day 2	8.7	9.4	7.7	9.4	9.1	10.7	9.2			
Day 3	8.6	9.6	7.5	9.3	8.1	9.0	9.1			

**Is Jim at glycaemic target?**

**What is Jim's glycaemic target?**

**What are our options in getting Jim to glycaemic target?**

**Jim has agreed to commence on insulin**

**Which insulin?  
Dinner injection?  
Bed time basal injection?  
Morning dose?  
How much do we start Jim on?**

<b>Before</b> HbA1c 8.1%	Self - monitored blood glucose (mmol/L)							Before Bed	Overnight	Comments
	Breakfast		Lunch		Dinner					
	Before	After	Before	After	Before	After				
Day 1	9.1	9.2	7.8	9.8	9.5	11.1	9.3		GLP1 Only	
Day 2	8.7	9.4	7.7	9.4	9.1	10.7	9.2		GLP1 Only	
Day 3	8.6	9.6	7.5	9.3	8.1	9.0	9.1		GLP1 Only	

HbA1c 8.1%	Self - monitored blood glucose (mmol/L)							Before Bed	Overnight	Comments
	Breakfast		Lunch		Dinner					
	Before	After	Before	After	Before	After				
Day 1	8.4	8.8	7.4	8.8	8.2	10.5	9.0		10 units basal insulin at bed time	
Day 2	8.2	8.9	7.3	8.7	7.8	9.8	8.9		10 units basal insulin at bed time	
Day 3	7.7	8.2	6.9	8.3	7.7	8.9	8.7		10 units basal insulin at bed time	

Lowest BSL previous three readings	Adjustment for next dose
≥ 7.0 mmol/L	(+2 units)
4.1 - 6.9 mmol/L	0 units
≤ 4.0 mmol/L	(-2 units)

HbA1c 8.1%	Self - monitored blood glucose (mmol/L)							Before Bed	Overnight	Comments
	Breakfast		Lunch		Dinner					
	Before	After	Before	After	Before	After				
Day 1	8.4	8.8	7.4	8.8	8.2	10.5	9.0		10 units bedtime	
Day 2	8.2	8.9	7.3	8.7	7.8	9.8	8.9		10 units bedtime	
Day 3	7.7	8.2	6.9	8.3	7.7	8.9	8.7		10 units bedtime	

## What next?

HbA1c 8.1%	Self - monitored blood glucose (mmol/L)							Before Bed	Overnight	Comments
	Breakfast		Lunch		Dinner					
	Before	After	Before	After	Before	After				
Day 1	7.8	8.2	6.8	8.3	7.7	9.6	8.7		12 Units bedtime	
Day 2	7.7	8.4	7.1	8.4	7.5	9.4	8.5		12 Units bedtime	
Day 3	7.4	8.1	7.0	8.0	7.6	8.6	7.9		12 Units bedtime	

HbA1c 8.1%	Self - monitored blood glucose (mmol/L)								Comments
	Breakfast		Lunch		Dinner		Before Bed	Overnight	
	Before	After	Before	After	Before	After			
Day 1	7.8	8.2	6.8	8.3	7.7	9.6	8.7		12 units bedtime
Day 2	7.7	8.4	7.1	8.4	7.5	9.4	8.5		12 units bedtime
Day 3	7.4	8.1	7.0	8.0	7.6	8.6	7.9		12 units bedtime

What next?

HbA1c 8.1%	Self - monitored blood glucose (mmol/L)								Comments
	Breakfast		Lunch		Dinner		Before Bed	Overnight	
	Before	After	Before	After	Before	After			
Day 1	7.2	7.7	6.5	7.3	6.9	8.5	8.1		14 Units bedtime
Day 2	7.3	7.9	7.1	8.1	7.1	8.8	8.2		14 Units bedtime
Day 3	6.9	7.4	6.7	7.8	6.8	8.3	7.6		14 Units bedtime

HbA1c 8.1%	Self - monitored blood glucose (mmol/L)								Comments
	Breakfast		Lunch		Dinner		Before Bed	Overnight	
	Before	After	Before	After	Before	After			
Day 1	7.2	7.7	6.5	7.3	6.9	8.5	8.1		14 units bedtime
Day 2	7.3	7.9	7.1	8.1	7.1	8.8	8.2		14 units bedtime
Day 3	6.9	7.4	6.7	7.8	6.8	8.3	7.6		14 units bedtime

What next?

HbA1c 8.1%	Self - monitored blood glucose (mmol/L)								Comments
	Breakfast		Lunch		Dinner		Before Bed	Overnight	
	Before	After	Before	After	Before	After			
Day 1	6.8	7.2	5.9	6.9	6.1	8.1	7.9		16 units bedtime
Day 2	6.2	7.0	6.3	7.8	7.1	8.2	8.0		16 units bedtime
Day 3	6.2	7.1	6.4	7.7	6.5	8.3	8.2		16 units bedtime



HbA1c 8.1%	Self - monitored blood glucose (mmol/L)							Comments	
	Breakfast		Lunch		Dinner		Before Bed		Overnight
	Before	After	Before	After	Before	After			
Day 1	6.8	7.2	5.9	6.9	6.1	8.1	7.9	16 units bedtime	
Day 2	6.2	7.0	6.3	7.8	7.1	8.2	8.0	16 units bedtime	
Day 3	6.2	7.1	6.4	7.7	6.5	8.3	8.2	16 units bedtime	

### What next?

HbA1c 8.1%	Self - monitored blood glucose (mmol/L)							Comments	
	Breakfast		Lunch		Dinner		Before Bed		Overnight
	Before	After	Before	After	Before	After			
Day 1	4.8	5.7	5.5	6.2	5.9	7.3	6.8	18 units bedtime	
Day 2	5.1	6.2	5.6	5.8	5.4	7.6	7.2	18 units bedtime	
Day 3	5.8	6.7	6.4	7.7	6.5	8.3	8.0	18 units bedtime	

HbA1c 8.1%	Self - monitored blood glucose (mmol/L)							Before Bed	Overnight	Comments
	Breakfast		Lunch		Dinner					
	Before	After	Before	After	Before	After				
Day 1	4.8	5.7	5.5	6.2	5.9	7.3	6.8		18 units bedtime	
Day 2	5.1	6.2	5.6	5.8	5.4	7.6	7.2		18 units bedtime	
Day 3	5.8	6.7	6.4	7.7	6.5	8.3	8.0		18 units bedtime	

HbA1c 8.1%	Self - monitored blood glucose (mmol/L)							Before Bed	Overnight	Comments
	Breakfast		Lunch		Dinner					
	Before	After	Before	After	Before	After				
Day 1	6.3	7.7	6.5	7.3	6.9	8.5	8.1		16 units bedtime	
Day 2	7.3	7.9	7.1	8.1	7.1	8.8	8.2		16 units bedtime	
Day 3	6.1	7.4	6.7	7.8	6.8	8.3	7.6		16 units bedtime	

# Jim was commenced on Co-Form 10 units

HbA1c 9.3%	Self - monitored blood glucose (mmol/L)						Before Bed	Overnight	Comments
	Breakfast		Lunch		Dinner				
	Before	After	Before	After	Before	After			
Day 1	6.7	7.8	7.0	8.9	7.5	13.6	11.2		
Day 2	5.9	7.7	7.2	10.7	7.7	12.5	10.9		
Day 3	6.1	7.7	7.5	9.6	7.1	11.1	10.2		

HbA1c 9.3%	Self - monitored blood glucose (mmol/L)						Before Bed	Overnight	Comments
	Breakfast		Lunch		Dinner				
	Before	After	Before	After	Before	After			
Day 1	5.9	7.8	7.0	8.9	7.5	9.6	8.2	10 units dinner	
Day 2	5.4	6.8	6.2	9.4	6.7	9.3	8.1	10 units dinner	
Day 3	5.8	6.7	5.5	7.6	6.3	8.1	7.2	10 units dinner	

HbA1c 8.3%	Self - monitored blood glucose (mmol/L)							Comments	
	Breakfast		Lunch		Dinner		Before Bed		Overnight
	Before	After	Before	After	Before	After			
Day 1	7.1	11.2	10.1	11.3	8.3	8.6	8.5		
Day 2	7.2	11.5	9.8	11.4	8.4	9.2	8.3		
Day 3	6.8	12.8	10.1	11.3	8.1	10.3	9.4		

HbA1c 8.3%	Self - monitored blood glucose (mmol/L)							Comments	
	Breakfast		Lunch		Dinner		Before Bed		Overnight
	Before	After	Before	After	Before	After			
Day 1	6.1	7.6	7.1	8.6	6.8	7.8	7.5	10 units breakfast	
Day 2	6.2	8.1	7.6	9.5	7.8	8.3	8.3	10 units breakfast	
Day 3	6.2	7.3	6.8	8.1	6.9	8.2	7.3	10 units breakfast	

# What else do we have to consider after starting Jim on insulin?

- Driving Licencing Authority**
- SMBG & NDSS changes**
- Hypoglycaemia management**
- Sick day management**
- Lifestyle measures**
- Complications screening**
- Medication review (PBS)**

# Titration Algorithm

Lowest BSL previous three readings	Adjustment for next dose
$\geq 7.0$ mmol/L	(+2 units)
4.1 - 6.9 mmol/L	0 units
$\leq 4.0$ mmol/L	(-2 units)

“...lowest of previous three readings...”

# What if Jim is your usual truck driver?

HbA1c 8.3%	Self - monitored blood glucose (mmol/L)							Comments	
	Breakfast		Lunch		Dinner		Before Bed		Overnight
	Before	After	Before	After	Before	After			
Day 1	7.8	8.2	7.5	9.5	7.7	11.4	9.2		
Day 2	7.5	8.6	8.1	9.0	7.4	11.7	9.4		
Day 3	7.7	8.2	7.3	8.8	7.0	11.4	8.9		

## Commenced on Co-Formulation insulin

HbA1c 8.3%	Self - monitored blood glucose (mmol/L)								Comments
	Breakfast		Lunch		Dinner		Before Bed	Overnight	
	Before	After	Before	After	Before	After			
Day 1	6.4	7.6	7.1	8.1	7.2	8.4	8.2		Co-Form. 10 Units <b>dinner</b>
Day 2	<b>6.3</b>	<b>7.4</b>	<b>7.0</b>	<b>8.0</b>	<b>6.9</b>	<b>7.7</b>	<b>7.5</b>		Co-Form. 10 Units <b>dinner</b>
Day 3	6.2	7.5	7.3	8.3	7.0	8.3	7.8		Co-Form. 10 Units <b>dinner</b>



	Self - monitored blood glucose (mmol/L)								Comments
	Breakfast		Lunch		Dinner		Before Bed	Overnight	
	Before	After	Before	After	Before	After			
Day 1	6.2	7.7			6.5	7.8	7.5		<b>12 Units Co-Form Dinner</b>
Day 2					<b>7.1</b>	<b>8.4</b>	<b>8.0</b>		<b>12 Units Co-Form Dinner</b>
Day 3	7.1	8.1			6.6	8.1	7.9		<b>12 Units Co-Form Dinner</b>
Day 4									<b>12 Units Co-Form Dinner</b>
Day 5	6.8	7.9			5.9	7.7	7.0		<b>12 Units Co-Form Dinner</b>
Day 6	<b>6.4</b>	<b>7.1</b>			<b>6.3</b>	<b>6.5</b>	<b>5.8</b>		<b>12 Units Co-Form Dinner</b>
Day 7	<b>4.1</b>	5.7							

	Self - monitored blood glucose (mmol/L)								Comments
	Breakfast		Lunch		Dinner		Before Bed	Overnight	
	Before	After	Before	After	Before	After			
Day 1	6.3	7.7			6.5	7.8	7.5		<b>10 Units Co-Form Dinner</b>
Day 2					<b>7.1</b>	<b>8.4</b>	<b>8.0</b>		<b>10 Units Co-Form Dinner</b>
Day 3	7.4	8.1			6.6	8.1	7.9		<b>10 Units Co-Form Dinner</b>
Day 4									<b>10 Units Co-Form Dinner</b>
Day 5	6.8	7.9			5.9	7.7	7.0		<b>10 Units Co-Form Dinner</b>
Day 6	<b>6.3</b>	<b>7.1</b>			<b>6.3</b>	<b>6.5</b>	<b>5.8</b>		<b>10 Units Co-Form Dinner</b>
Day 7	6.1	6.7							<b>10 Units Co-Form Dinner</b>

## In summary

- It doesn't matter what dose insulin we initiate, we always need to titrate the dose of insulin to glucose targets
- Insulin titration is *easily* managed in primary care
- **Dinner Mix insulin** dose is titrated against morning glucose readings
- **Morning Mix insulin** dose is titrated against pre-dinner glucose readings
- **Bed time basal insulin** is titrated against morning fasting glucose readings
- In general, HbA1c target for patients on insulin is ~7.0%
- HbA1c targets for patients on insulin with other co-morbidities may need to be a little higher than 7.0%