



*Strategies for Ensuring the*

# Safe Use of Insulin Pens IN THE HOSPITAL

## Strategies to Improve Patient Safety with Insulin Pens in the Hospital

The University of Vermont Health Network  
Champlain Valley Physicians Hospital  
Plattsburgh, New York

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## Team Members

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  - Laura Conrad, Pharm.D., PGY-1 Pharmacy Practice Resident
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## The University of Vermont Health Network – Champlain Valley Physicians Hospital

- A private, non-profit, level II trauma center serving a tri-county area of 170,000 lives in northeastern New York
- Licensed for 323 inpatient beds, including ICU, Progressive Care, Med/Surg, L&D-OB, Pediatrics, Adult and Child Adolescent Mental Health
- Average 10,000 inpatient admissions, 22,000 surgical procedures, 5,000 emergency room visits, 1100 births annually
- 2,400 staff members; 165 physicians

## Background and Description

- Insulin pens added to formulary in 2007 to better accommodate BCMA and to advance removal of multi-dose insulin vials from nursing units
- “One patient-One pen” was the standard from day one
- Insulin pens dispensed to all patients with orders for insulin doses of 80 units or less
- After the first reports of improper use of insulin pens in 2009, pharmacy initiated proactive education campaign
  - Regular reminders and updates in the pharmacy newsletter
  - Posters in all medication rooms highlighting the possibility of regurgitation of biologic material into insulin pens during administration
  - Pharmacist presentations during interdisciplinary rounds

## Background and Description

- After reports of yet another hospital that may have used insulin pens inappropriately in 2013, an ad hoc advisory board convened to evaluate the continued use of insulin pens at CVPH
  - Team members: ID physician, VP of Medical Affairs, Risk Manager, Quality Director, Infection Control Manager, Med/Surg Nurse Director, VP of Patient Services, Director of Pharmacy, Clinical Pharmacy Manager
  - Pros and cons of insulin vial vs. insulin pen safety reviewed
  - Conclusion: Insulin pens provide greater patient safety compared with insulin vials with a low risk of patient to patient transmission of disease. All measures to ensure patient safety with insulin pens should be explored and implemented.

## Insulin Pen Storage & Labeling Audit

- Three nursing units audited: Progressive Care, R6, and R7

Pt. Care Area	Baseline Audit		Post-Education Audit		Properly Stored & Labeled Change (%)
	Pens Audited Baseline (#)	Properly Stored & Labeled (%)	Post Pens Audited (#)	Post Properly Stored & Labeled (%)	
R6	29	76%	22	73%	-3%
Progressive Care	25	60%	21	71%	11%
R7	30	80%	16	62%	-18%
Total	84	73%	59	69%	-4%

Properly stored & labeled = active order, storage per policy, pen labeled, label attached to barrel, and expiration date on label.

## Process Improvements: Insulin Pen Storage & Labeling

**Problem:** Insulin pen storage audit revealed that discharge patient pens may be found in the med room up to 5 days later.

**Improvement:** Daily census generated twice daily to identify discharged patients. Technicians review on every delivery to med rooms and remove all medications for discharged patients.

**Problem:** Insulin pens dispensed with tamper tape on the circumference of the pen-cap could be removed and replaced without rupturing tamper tape.

**Improvement:** Education of pharmacy staff to apply tamper tape to all insulin pens longitudinally down the long access of the pen.

## Insulin Pen Administration Audit

- Three nursing units audited: Progressive Care, R6, and R7
- 15 steps of insulin pen preparation and administration observed

Time Frame	Baseline Audit		Post-Education Audit		Change (%)
	Observations (#)	Performed Steps Correctly (%)	Observations (#)	Performed Steps Correctly (%)	
Pre-Breakfast	18	98%	22	97%	-1%
Pre-Lunch	19	93%	11	94%	1%
Pre-Dinner	9	97%	9	94%	-3%
Bedtime	0	0%	7	99%	99%
Other	1	94%	2	97%	3%

## Process Improvements: Insulin Pen Administration

**Problem:** Nurse survey revealed nurses unfamiliar with onset and duration of different insulin types and when to hold insulin.

**Improvement:** Nurses assigned online education via HealthStream. Pharmacy prepared and posted posters listing the pharmacokinetic/pharmacodynamic properties of each insulin type and parameters for holding insulin doses due to patient condition in every med room.

**Problem:** Nurse survey revealed nurses needed refresher on proper assembly and preparation of insulin pens and proper administration (“air-shot”, releasing skin after injection, presence of insulin on the skin after injection)

**Improvement:** Nurses assigned online education via HealthStream.

**Problem:** Nursing student and Instructor found with pens for 2 different patients (2 pens each patient) preparing for administration.

**Improvement:** Instructors of the 3 local nursing schools contacted and requested to add coursework with a focus specifically on insulin pen administration and safety, including one-patient-one-pen philosophy.

### Insulin Time-Action Profiles

Brand	Generic	Type	Onset of Action	Peak Effect	Duration of Action	Misc.
Novolog	Insulin aspart	Rapid Acting	10-20 minutes	1-3 hours	3-4 hours	Should be given within 5-10 min of a meal due to rapid onset
Novolin N	NPH	Intermediate	1-4 hours	4-14 hours	10-24 hours	
Novolin R	Regular	Regular	0.5-1 hour	2-3 hours	3-6 hours	
Novolog 70/30	Aspart/Aspart protamine	Rapid Acting/Intermediate	15 minutes	1-4 hours	Up to 24 hours	Mixed pen with 30% aspart insulin and 70% aspart protamine insulin Roll vial/pen between hands gently to mix insulin
Lantus	Glargine	Basal	4-5 hours	No Peak	24 hours	Does not rapidly lower blood glucose
Levemir	Detemir	Basal	1-3 hours	No Peak	20 hours	Does not rapidly lower blood glucose

#### When to Hold Insulin:

##### **ALWAYS OBTAIN DIRECTIONS FROM PHYSICIAN BEFORE HOLDING BASAL INSULIN**

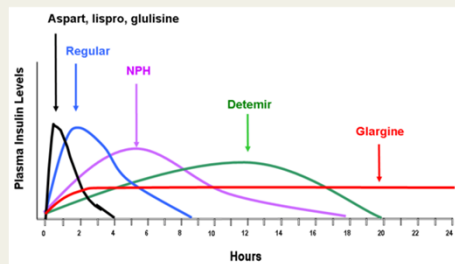
**Prandial (mealtime) Insulin:** Hold when patient is not expected to eat at least 50% of meal

**Correctional Insulin:** Hold when blood glucose is outside of administration range

**Basal Insulin (glargine/detemir):**

- Type 1 diabetic patients will usually require full basal home dose coverage even if NPO
- Type 2 diabetic patients may need basal dose reduction if NPO
  - May need to decrease dose by 50-80% depending upon blood glucose control and whether the patient was on a physiologic (basal/bolus) regimen at home

#### Insulin Time-Action Profiles:



## Process Improvement: Patient-specific Bar Codes on Insulin Pens

- 3/27/15: Siemens Pharmacy vendor approved customization request to add patient-specific identifier to insulin pen labels
- Pharmacy IT and Siemens engineers designed an order- and patient-specific label and bar code
- 4/1/15: Pharmacy IT validated bar code design and functionality in test system
- Late June 2015: Pharmacy label vendor software update to implement patient-specific bar code label

## Nurse Education Survey

- All nurses asked to complete a survey that included 3 videos demonstrating insulin pen preparation and administration followed by a multiple choice quiz
- Pre-implementation response rate: 10.3%
- Post-education response rate: 22%
- Team chose 3 questions for process improvement

## Selected Results: Nurse Survey

6. Which of the following scenarios would place Ms. Jones at greatest risk of a hypoglycemic event in the 6 hours following insulin administration? (Select only one) Correct answer in **RED**

Answer	Baseline		Post	
	Response	%	Response	%
The patient's BG measurement at 10pm is 109 mg/dL. It is a very busy evening and the administration of medications falls behind schedule. The insulin (long) dose is given 2 hours late.	5	13%	11	12%
The patient's actual BG reading is 148 mg/dL but the nurse misreads the flow chart. Believing the measurement is 184 mg/dL, the nurse gives insulin (rapid) according to the scale 4 minutes before the patient starts eating lunch.	8	21%	17	19%
<b>The patient's BG measurement at 7:30am is 162 mg/dL. The nurse administers insulin (rapid) according to the scale at 8:07am. The patient is taken to get an MRI at 8:20am. Breakfast arrives at 8:34am.</b>	<b>25</b>	<b>66%</b>	<b>62</b>	<b>68%</b>
The patient's BG measurement is 217 mg/dL at 5:06pm. The dinner meal is delivered at 5:12pm. The patient eats half of the meal before the nurse can administer insulin (rapid) according to the scale at 5:21pm. The patient eats the rest of the meal except for the sugar-free Jello®.	0	0%	1	1%
<b>Total</b>	<b>38</b>	<b>100%</b>	<b>91</b>	<b>100%</b>

## Selected Results: Nurse Survey

7. Which of the following are TRUE/CORRECT statement(s) regarding the use of insulin pen devices? (Select all that apply) Correct answer in **RED**

Answer	Baseline (n=38)		Post (n=91)	
	Response	%	Response	%
<b>Insulin pen devices should be primed; (e.g., give an air shot) such that a drop appears at the end of the needle prior to each and every use.</b>	<b>36</b>	<b>95%</b>	<b>87</b>	<b>96%</b>
<b>After injecting insulin into the patient, the pen should be held against the skin for at least 5 or 6 seconds before withdrawing the needle.</b>	<b>35</b>	<b>92%</b>	<b>88</b>	<b>97%</b>
After administration, a drop of fluid on the skin indicates that a portion of the dose has leaked from the injection site.	24	63%	57	63%
The routine use of insulin pen devices significantly reduces the transmission of infections in hospitals.	23	61%	61	67%
Studies have shown that using insulin pen devices leads to more dosing errors when compared with the traditional insulin vial and syringe method.	0	0%	3	3%

## Selected Results: Nurse Survey

11. In the past 3 months, which of the following have you seen or witnessed at our institution? (Select all that apply)

Answer	Baseline (n=38)		Post (n=91)	
	Response	%	Response	%
An insulin pen device with a defective dosing dial.	1	3%	2	2%
An insulin pen device used on more than one patient.	0	0%	0	0%
An insulin pen device without a patient-specific label attached to it.	13	34%	27	30%
An insulin pen device stored in an “unapproved” location (e.g., patient’s bedside, nursing station drawer).	23	61%	44	48%
Insulin withdrawn from an insulin pen device or cartridge with a syringe (i.e., using the pen device/cartridge like a multiple dose vial).	1	3%	8	9%
I have not witnessed any of these in the past 3 months.	15	39%	42	46%

## Next Steps

- Implement patient-specific bar code labels for insulin pens
- Continue to conduct periodic administration and storage audits to maintain our level of vigilance
- Continue publication of education materials to reinforce the safe use of insulin pens





## Summary

- Participation in the program, including our nursing and storage audits, has heightened awareness of staff to our commitment to the safe use of insulin pens.
- Nurses are more aware than ever of the importance of proper administration and storage of insulin pens.
- Nurse managers requested auditing tools to continue to monitor insulin pen administration and storage to prevent sliding back into “old” behaviors.
- Most importantly, if not for the collaboration with other institutions in this program, we may have not pushed our vendor to create a patient-specific insulin bar code label. Realization that other pharmacy systems were capable of this task reinforced our efforts.