



Left to right: Tricia Woodard, Marie Sellar, Heather Brannigan, Jo Wickham, Fritz Yap, Cathy Hulbert, Grainne McAnnalley

Background

Nurse specialists play an important role in the delivery of CT coronary angiography (CTCA) in the acute chest pain setting. The appropriate dosing of oral and intravenous beta-blockers is crucial to achieve the required heart rate at time of scan of 60 bpm or less. A beta blocker dosing protocol was developed at North Shore Hospital as a guideline for prescription. Nurse specialists worked with the developed dosing protocol over 18 months and found that it was necessary, at times, to deviate from the protocol due to patient history, timing of the scan or ECG information to achieve a safe and effective scan.

Methods

We prospectively collected data from August 2011 to February 2013 on the use of beta-blockade in patient preparation for CTCA. In our institution, nurse specialists with coronary care unit background administer beta-blockers without immediate hands-on medical supervision. A dosing protocol guides the administration of up to 150mg oral Metoprolol tartrate according to baseline heart rate, but can be varied depending on patient status. Up to 30mg intravenous Metoprolol is administered at the time of scanning should heart rate control be inadequate.

Results

Of the 1104 patients prepared for CTCA, 35 patients (3%) did not proceed due to inadequate heart rate control despite maximum beta blockade administration. The analysis excluded 108 patients on regular beta-blocker and 16 patients who had calcium channel blocker for heart rate control. Protocol adjustments occurred in half the patients, with a lower Metoprolol dose given in 388 patients (41%). Subsequent IV Metoprolol is more frequent, compared to those given the suggested dosage. (41% vs. 30%, $p=0.0074$) Safety is excellent, with rare complications: mild dizziness (1%), hypotension (2%, only 1 case was symptomatic).

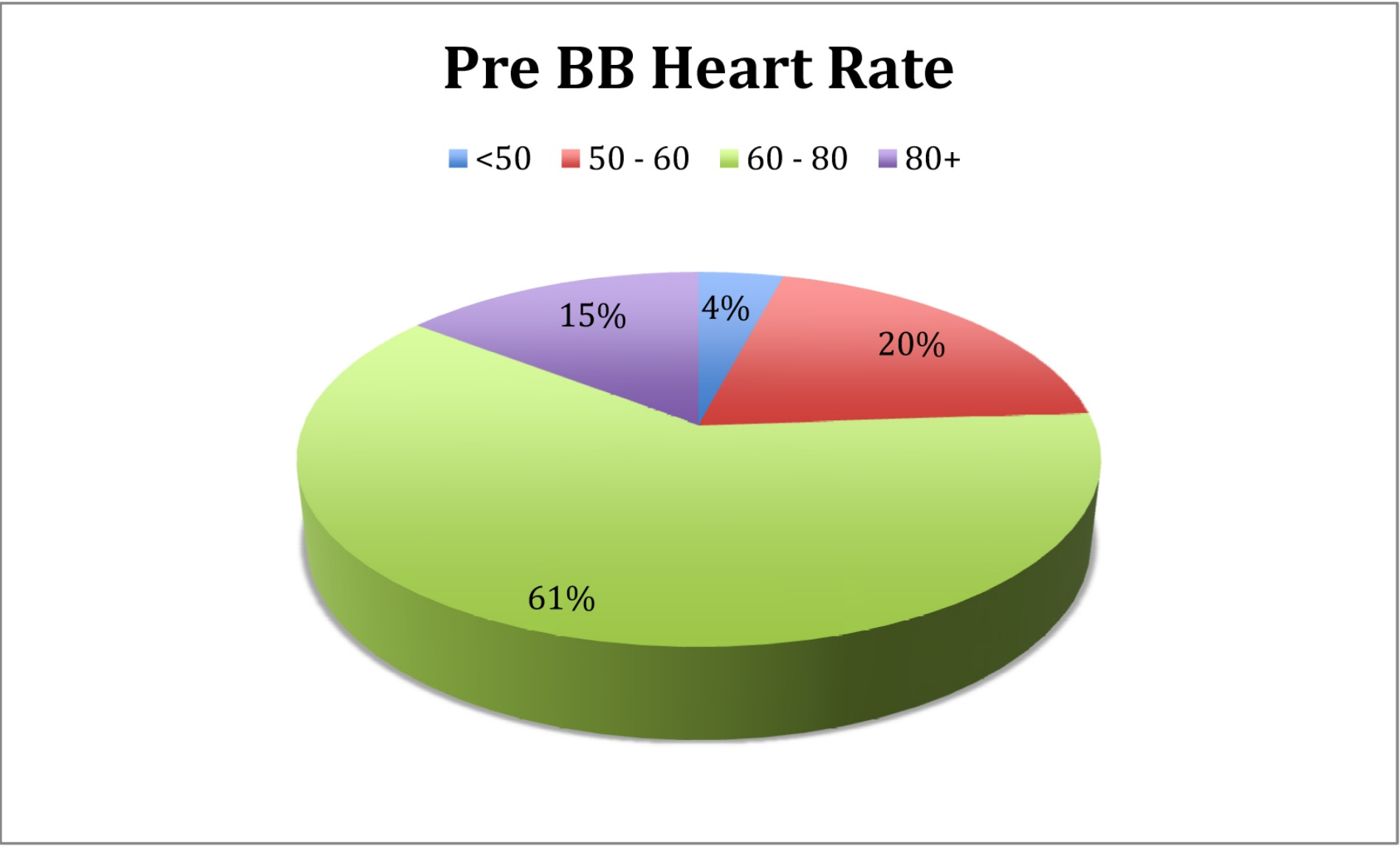
N=956	Suggested Dosage by the oral beta-blocker protocol			
Actual Dosage	No bB (HR <50)	Metoprolol tartrate 50mg (HR 50-60)	Metoprolol tartrate 100mg (HR 60-80)	Metoprolol tartrate 150mg (HR >80)
No bB	39 (2.5% required IV BB)	105 (22% required IV BB)	95 (60% required IV BB)	9 (56% required IV BB)
50mg	0	85 (7% required IV BB)	131 (28% required IV BB)	5 (60% required IV BB)
100mg	0	0	362 (30% required IV BB)	43 (53% required IV BB)
150mg	0	0	0	82 (61% required IV BB)

This table shows the standard oral BB dosage protocol (per heart rate in beats per minute) versus the actual dosage given. Highlighted boxes indicate where the standard protocol dose was administered.

Safe nurse-led pre-CTCA beta-blockade administration can be achieved without intensive medical supervision

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Of all patients presenting for CTCA, only 24% have a heart rate in the required range for achieving good images via CT scanning. The remaining 76% of patients will require heart rate management with Beta blockade. The North Shore Hospital protocol for heart rate management is as follows:

First Name: _____ Gender: _____

Surname: _____

Date of Birth: _____ NHF: _____

Ward/Clinic: _____ Consultant: _____

CT Angiography Beta Blocker Protocol

Parameters

Blood pressure must be >110/65 prior to administration of Beta Blocker medication unless otherwise communicated by a medical staff member.

- Oral beta blocker – pulse/blood pressure 45 minutes after administration
- Intravenous beta blocker – continuous cardiac monitoring of heart rate and Rhythm. Blood pressure every 5 minutes.

Guide for medical team prescribing

Heart Rate	Metoprolol Oral Dose
50 bpm	None
50 – 60 bpm	Metoprolol Tartrate (immediate release) 50mg PO
60 – 80 bpm	Metoprolol Tartrate (immediate release) 100mg PO
>80 bpm (Not on Beta Blockers)	Metoprolol Tartrate (immediate release) 150mg PO
>80bpm (On Beta Blockers)	Consult Cardiologist

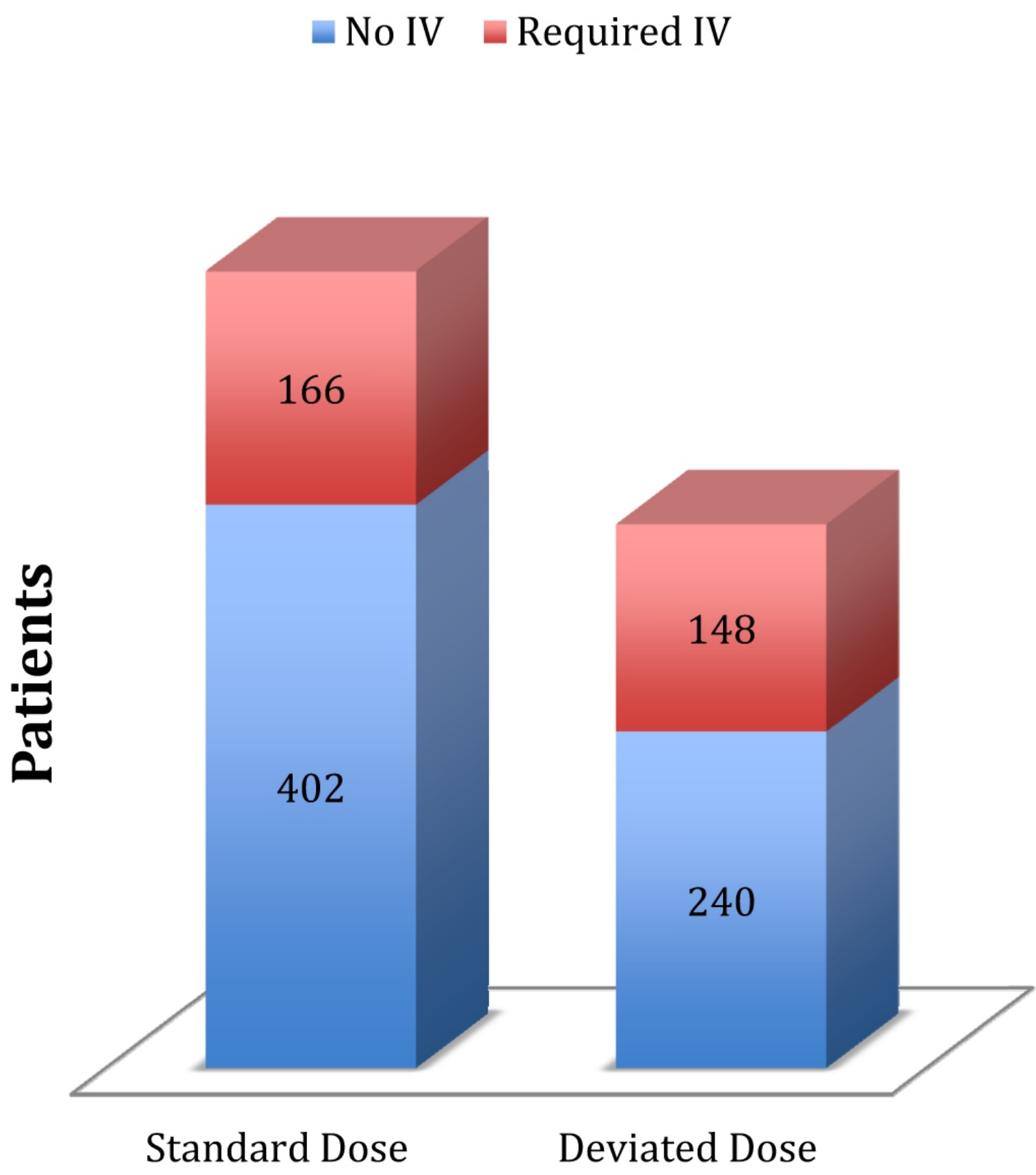
- If after 60 minutes, the heart rate remains >60bpm and BP is >110/65 mmHg, proceed to IV Beta Blocker protocol.

IV Beta Blocker Protocol (Standing Order): To be administered 5–10 minutes prior to CTA

Heart Rate	IV Metoprolol 5mg/5mls
Persistent Heart Rate	Give up to 5 mg as slow push over minimum of 30 seconds followed by 10ml normal saline flush
>60bpm	Give an additional 5mg each 5 mins as needed. (30mg max)
If heart rate drops to <50bpm	Stop IV Metoprolol

CTCA Nursing Sheet

Standard vs Deviated Dosage with Additional IV BB Use



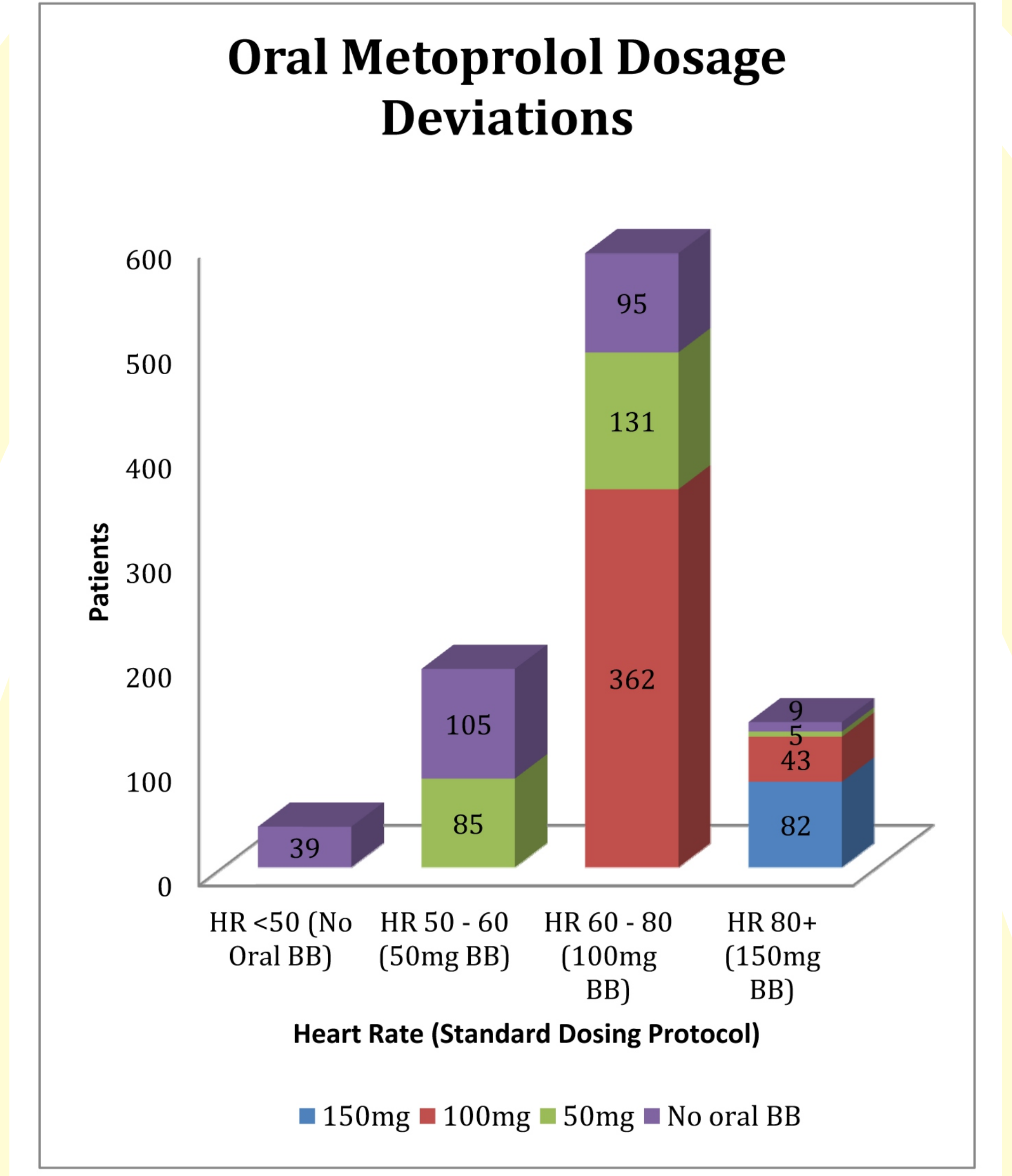
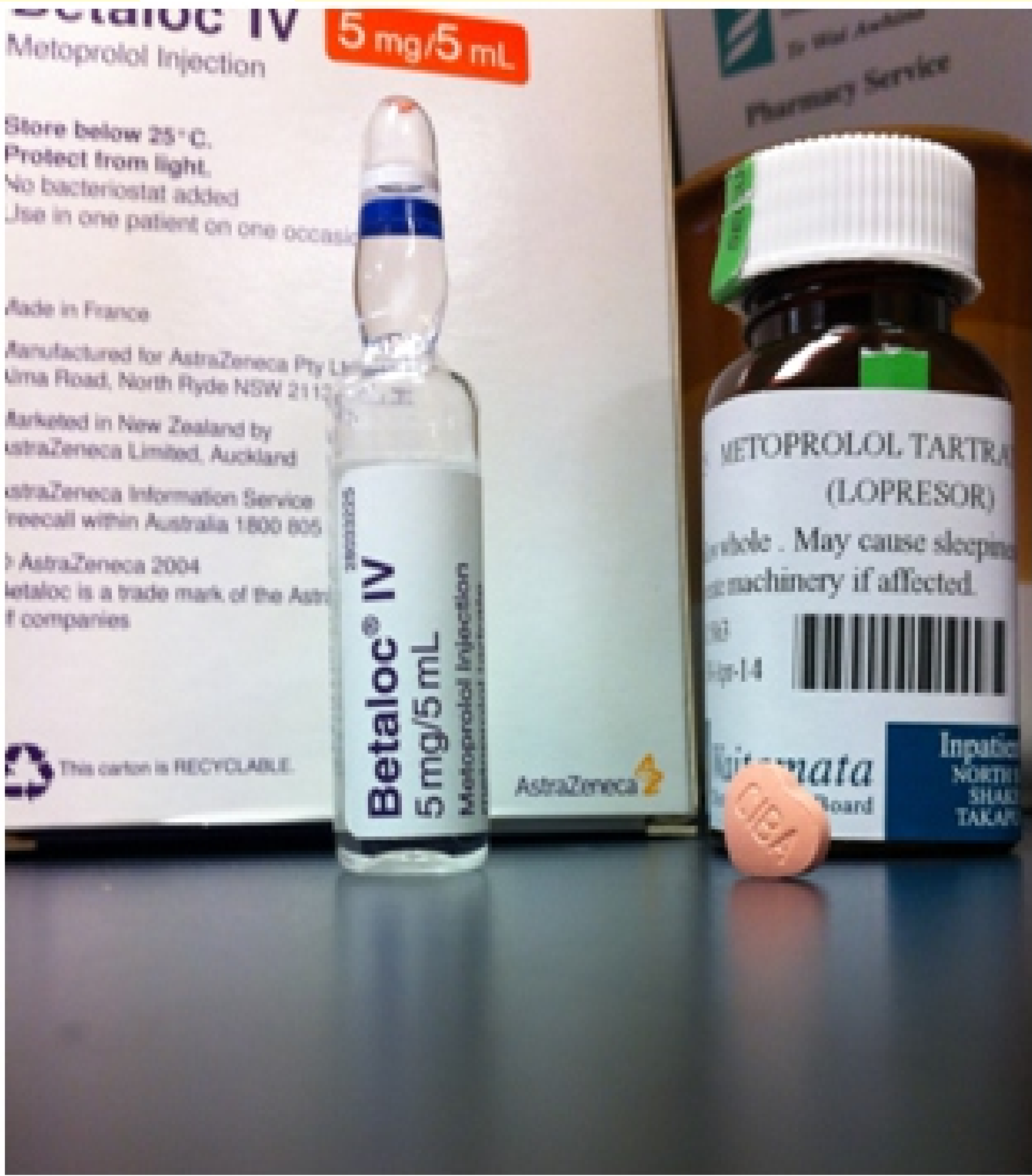
Deviation from the standard oral Beta Blocker protocol to a reduced dose leads to an increase in the frequency of IV Beta Blocker use. By comparing the percentage of patients on a standard dose of oral BB's requiring IV BB to the percentage of patients on the deviated dose requiring IV BB there is an 11% increase in the requirement for IV BB for patients in the deviated dose group.

Conclusion

Safe pre-CTCA beta-blockade relies heavily on sound clinical judgment of experienced nurse specialists in adjusting the protocol-suggested dosage according to clinical status, but can be achieved without intensive medical supervision.

Acknowledgements

Our fellow super-nurses – Fritz Yap, Cathy Hulbert, Marie Sellar, Tricia Woodard, Grainne McAnnalley and Suzanne Loader.



Adjustments to the standard oral Beta Blocker protocol always reflect a reduction in the dosage. Protocol deviation is often used in patients where there is either not enough time from preparation to scanning time for the oral BB to take effect or in patients where we are cautious of excessive BB effects for a clinical reason. In these cases it is understandable that the use of IV BB is increased as the onset is quick and the half life is minutes rather than hours.