

## Background

Patients with major burns (over 20%TBSA) are particularly susceptible to the deleterious effects of hypothermia. There is very little recent burn literature on the optimal temperature and humidity settings.

The purpose of this study was to determine 1.) what patient ambient room temperatures were in a Burn ICU at an ABA-verified burn centre, and 2.) to evaluate our ability to intervene and raise these temperatures expeditiously when required.

## Methods

**Baseline Data:** The ambient temperatures of nine patient rooms were recorded continuously, every minute, from 15 June until 15 December 2019 using a small, wall-mounted, smart sensor (SensorPush™) placed at standardized positions away from windows or electronic equipment. All devices were calibrated and standardized to <0.2°C and 2% respectively at 18-25°C. Data were sent to a mobile smartphone application and transferred to an excel spreadsheet for graphing and analysis.

**Interventions:** During the six-month period, on 15 August and 15 October 2019, room thermostats were simultaneously set to 'maximum' and the effect was monitored over three hours. This was identified as a sound change initiative and replicated a potential medical order to increase the ambient temperature during patient care.

## Results

Over the six-month period, there were 4 394 individual temperature measurements per room [Figure 1]. The mean ambient room temperature was 23.5°C ± 0.3°C (range 22.8°C to 24°C) [Figure 2].

Ambient temperatures deviated below a mean temperature of 22°C during 415 hours per room (9.4%, range 128-1069), and below 21°C during 54 hours per room (1.23%, range 2-145)[Table 1].

After the first intervention on 15 August 2019, [Figure 3] ambient temperatures increased minimally in seven of the nine rooms and only by 2-3°C in the other two rooms. The mean increase in temperature over 3 hours was only 1°C (range -0.8 to 3.26°C)

Following the second intervention on 15 October 2019 [Figure 4], the mean increase was 0.76°C (range -0.2 to 2.37°C). Again, only two of the rooms could be adjusted effectively, and only by about 2°C.

	Room 1	Room 2	Room 3	Room 4	Room 5	Room 6	Room 7	Room 8	Room 9	Mean
<21°C (69.8°F)	50	63	29	145	108	25	2	31	37	54.4
% of hours	1.14	1.43	0.66	3.3	2.45	0.5	0.04	0.71	0.84	1.23
<22°C (71.6°F)	128	386	295	588	1069	402	385	193	287	414.8
% of hours	2.9	8.7	6.72	13.39	24.3	9.2	8.77	4.39	6.53	9.4

Table 1

Celsius	Fahrenheit
21	69.8
21.5	70.7
22	71.6
22.5	72.5
23	73.4
23.5	74.3
24	75.2
24.5	76.1
25	77
25.5	77.9
26	78.8
26.5	79.7
27	80.6
27.5	81.5
28	82.4
28.5	83.3
29	84.2
29.5	85.1
30	86

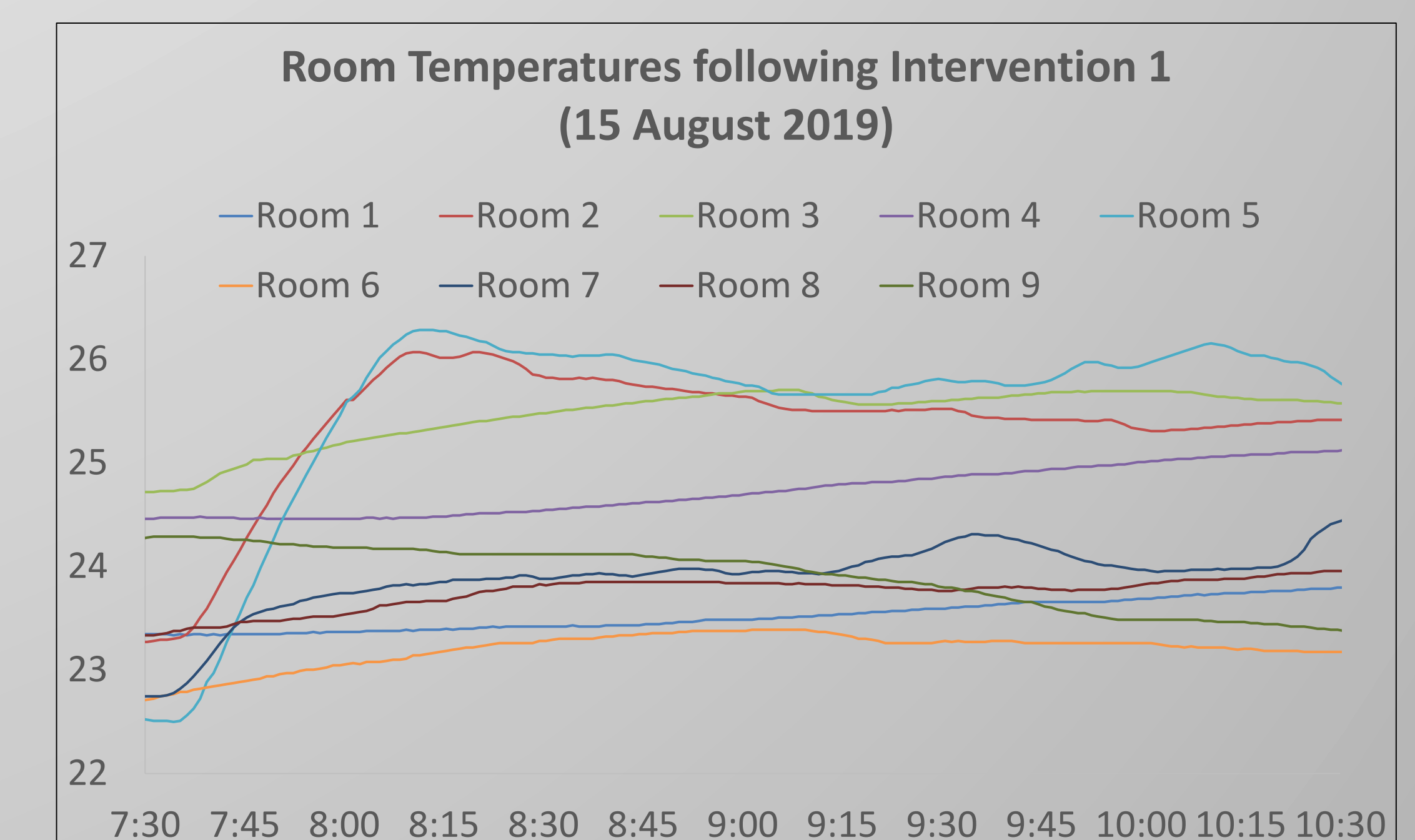


Figure 3

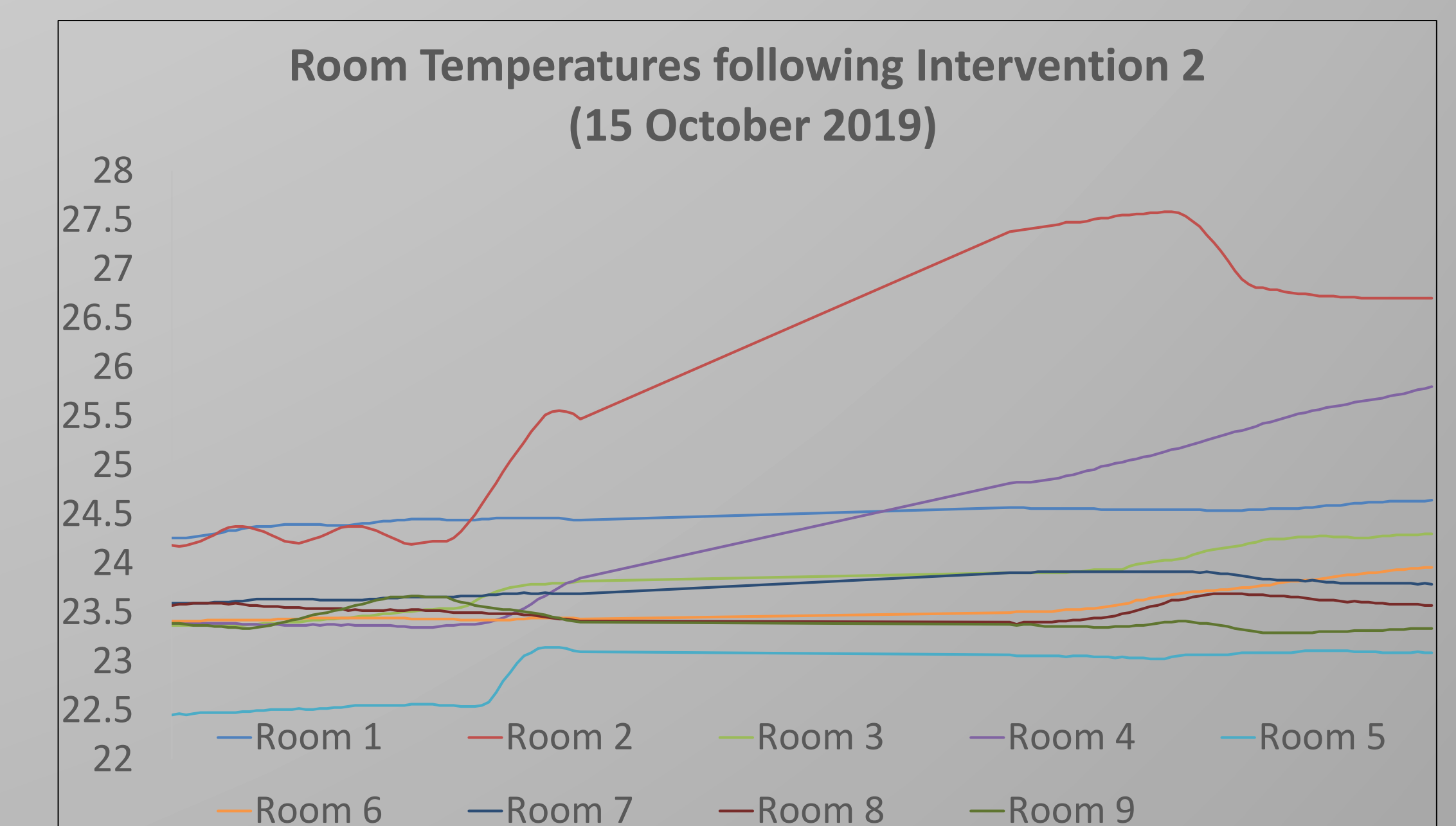


Figure 4

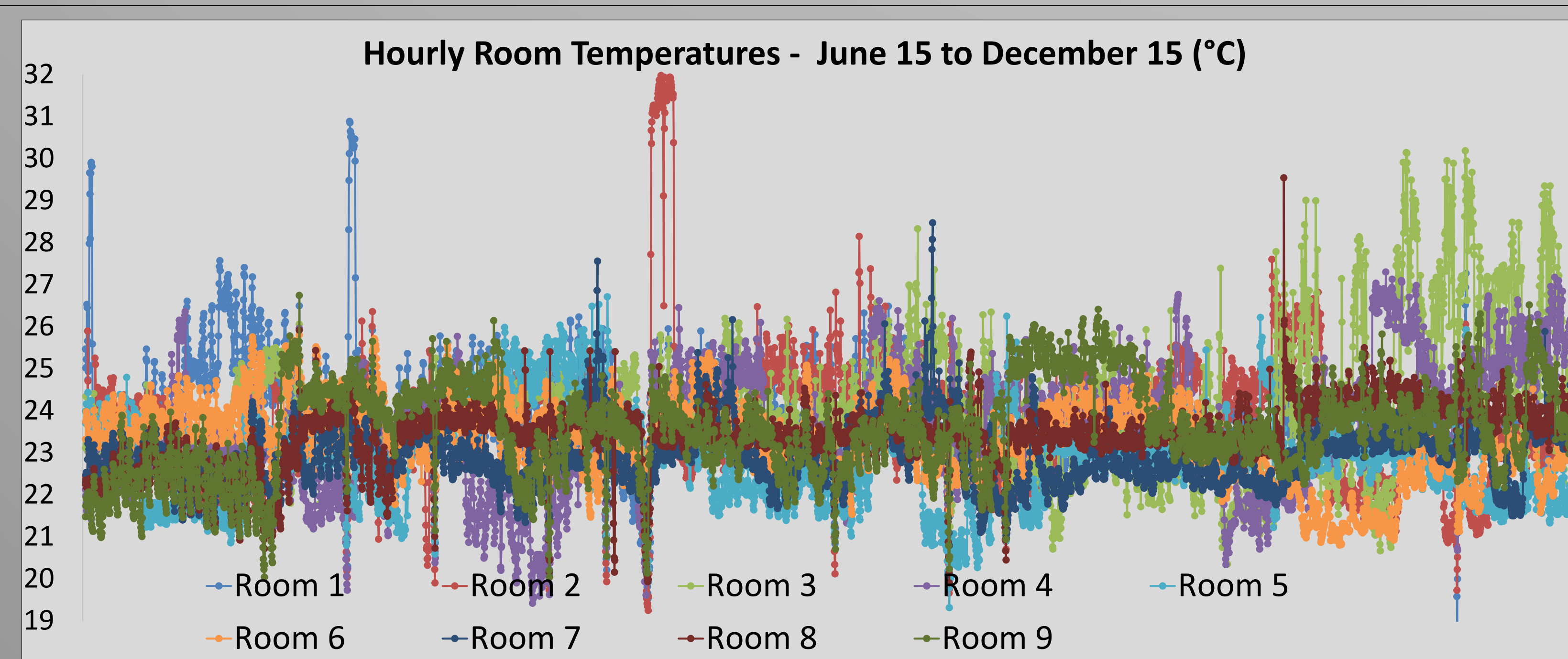


Figure 1

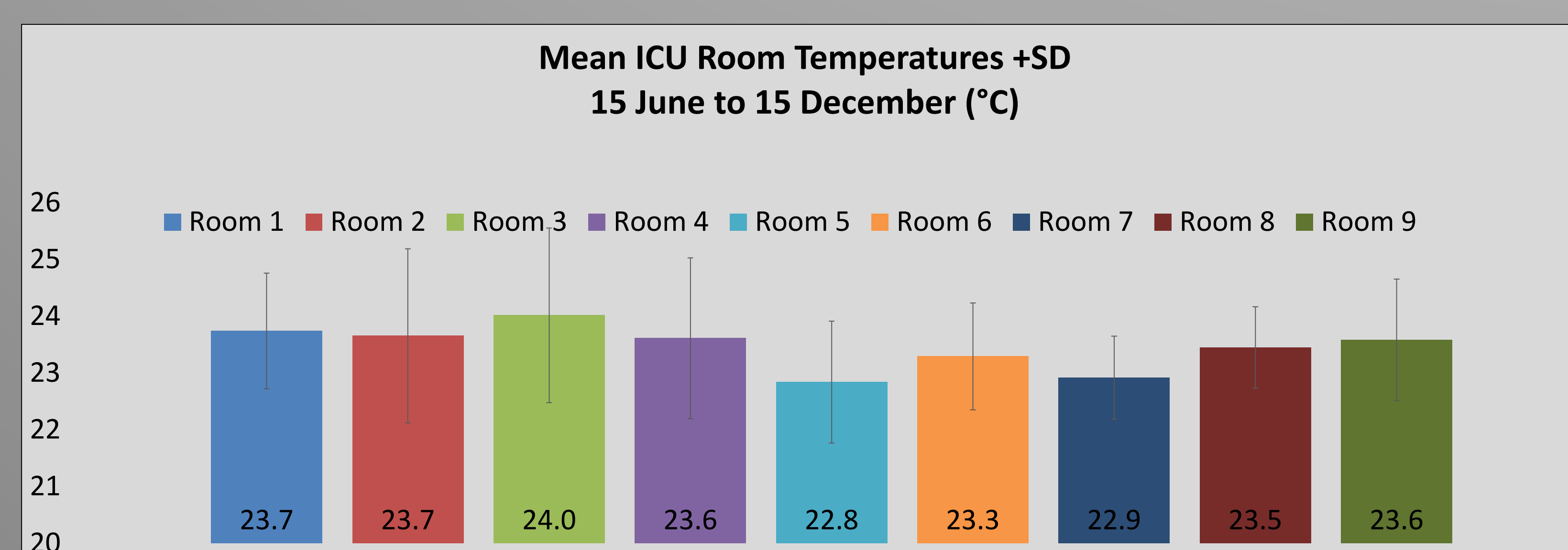


Figure 2

## Conclusions

Our burn ICU rooms are relatively cold and our ability to raise ambient temperature quickly is limited. During the stakeholder engagement part of this QI initiative, the Power Plant Operations and Maintenance Department indicated that all rooms were set to a specific temperature range centrally, with an ability to adjust temperatures both up and down by 5°C ( using a manual thermostat in each patient room.

Further change ideas being undertaken include: : 1) a facility engineering assessment, 2) set alerts on the smart sensors to inform staff when room temperatures fall below a designated threshold of 22°C (71.6°F), and 3) Empower the burn unit staff to increase the ambient temperatures as high as 30°C (86° F) within 30 minutes of adjustment, in order to optimize patient care.

## Lessons Learnt

1. The mean ambient temperature in patient rooms in a burn ICU is 23.5°C (74.3°F).
2. Efforts to rapidly increase these temperatures are relatively ineffective and responses vary significantly between rooms.