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Improved Pharmaceutical Products Protection via Remote Site Access of Temperature Monitoring and Alarm System for Pharmaceutical Refrigerators in Pharmacy Department at Our Lady of Maryknoll Hospital
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Introduction
Temperature excursion of pharmaceutical refrigerators in pharmacy could result in substantial financial loss, operation interruption and negative impact to patient safety. Both remote and local temperature alarm systems were in place in OLMH with alert panel at Operator. However, the system had an inherent shortcoming of trigger-off lag time up to 15 minutes. Further, without 24-hour pharmacy service, response time for on-site attendance to an alarm by pharmacy staff outside operating hours was highly dependent on the travelling time required by on-call pharmacist.

Objectives
To minimise drug wastage and patients' impact consequential to power failure and/or temperature excursion of pharmaceutical refrigerators by enhancing the temperature monitoring and alarm system of pharmaceutical refrigerators in Pharmacy Department, in order to enable timely impact assessment outside pharmacy operating hours for better contingency response to incidents.

Methodology
New temperature logger system was connected to auto-voice dialler and remote alarm on top of the existing alarm system in Mar 2014. Installation of monitoring software in computer enabled multiple temperature range settings and detailed temperature trending. Operator would notify on-duty or on-call pharmacist whenever an alarm were triggered by a refrigerator temperature falling outside preset range (i.e.
2-8°C during and 3.5-6.5°C outside pharmacy operating hours). Coupled with remote access of the latest detailed temperature log via Citrix outside pharmacy, this enhancement permitted remote monitoring and trending of abnormal temperatures well before actual excursion beyond the desirable temperature 2-8°C.

**Result**

Multiple temperature range setting function of new system permits tighter temperature control and monitoring of 3.5-6.5°C for pharmaceutical refrigerators outside pharmacy operating hours. The alarm lag time was greatly reduced from 15 to 1 minute. Closer temperature monitoring and trending of refrigerated drugs away from pharmacy was achieved. Remote access to temperature trending enables timely impact assessment for better contingency response to temperature excursion incidents. By enabling timely appropriate follow-up action, the enhancement costing $32,000 improves pharmaceutical products protection, and minimises potential drug wastage ($580,000), operation interruption and negative impact to patients consequential to power failure and/or temperature excursion of pharmaceutical refrigerators.