$$\text{------ MODULE } UML3 \text{ ------}$$

EXTENDS $Naturals$
VARIABLES $temperature,\ pulse,\ bp,\ oxygenLevel,\ vitals,\ location,\ time$

$temperatureNormal \triangleq (36 \,..\, 38)$
$pulseNormal \triangleq (60 \,..\, 100)$
$bpNormal \triangleq (90 \,..\, 120)$
$oxygenLevelNormal \triangleq (75 \,..\, 100)$
$medicineTime \triangleq \{x \in 1 \,..\, 12 : x\%3 = 0\}$

$TypeOK \triangleq$
 $\wedge\quad temperature \in (35 \,..\, 42)$
 $\wedge\quad pulse \in (50 \,..\, 130)$
 $\wedge\quad bp \in (60 \,..\, 150)$
 $\wedge\quad oxygenLevel \in (60 \,..\, 110)$
 $\wedge\quad vitals \in \{\text{"normal"},\ \text{"abnormal"}\}$
 $\wedge\quad location \in \{\text{"inside"},\ \text{"outside"}\}$
 $\wedge\quad time \in (1 \,..\, 12)$

$Init \triangleq$
 $\wedge\ temperature \in (35 \,..\, 42)$
 $\wedge\ pulse \in (50 \,..\, 130)$
 $\wedge\ bp \in (60 \,..\, 150)$
 $\wedge\ oxygenLevel \in (60 \,..\, 110)$
 $\wedge\ vitals = \text{"normal"}$
 $\wedge\ location \in \{\text{"inside"},\ \text{"outside"}\}$
 $\wedge\ time \in (1 \,..\, 12)$

$Var \triangleq \langle temperature,\ pulse,\ bp,\ oxygenLevel,\ vitals,\ location,\ time \rangle$

$CheckVitals \triangleq$
 $\vee\quad \wedge\ temperature \notin temperatureNormal$
  $\wedge\ vitals' = \text{"abnormal"}$
  $\wedge\ \text{UNCHANGED } \langle temperature,\ pulse,\ bp,\ oxygenLevel \rangle$
 $\vee\quad \wedge\ pulse \notin pulseNormal$
  $\wedge\ vitals' = \text{"abnormal"}$
  $\wedge\ \text{UNCHANGED } \langle temperature,\ pulse,\ bp,\ oxygenLevel \rangle$
 $\vee\quad \wedge\ bp \notin bpNormal$
  $\wedge\ vitals' = \text{"abnormal"}$
  $\wedge\ \text{UNCHANGED } \langle temperature,\ pulse,\ bp,\ oxygenLevel \rangle$
 $\vee\quad \wedge\ oxygenLevel \notin oxygenLevelNormal$
  $\wedge\ vitals' = \text{"abnormal"}$
  $\wedge\ \text{UNCHANGED } \langle temperature,\ pulse,\ bp,\ oxygenLevel \rangle$
 $\vee\quad \wedge\ temperature \in temperatureNormal$
  $\wedge\ pulse \in pulseNormal$
  $\wedge\ bp \in bpNormal$

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$\wedge$ *oxygenLevel* $\in$ *oxygenLevelNormal*
$\wedge$ *vitals*$'$ = "normal"
$\wedge$ UNCHANGED $\langle temperature,\ pulse,\ bp,\ oxygenLevel \rangle$

RingAlarm $\triangleq$ TRUE

Alarm $\triangleq$
    $\vee$ $\wedge$ *vitals* = "abnormal"
        $\wedge$ *RingAlarm*
        $\wedge$ *vitals*$'$ = "normal"
        $\wedge$ UNCHANGED $\langle location \rangle$
    $\vee$ $\wedge$ *location* = "outside"
        $\wedge$ *RingAlarm*
        $\wedge$ UNCHANGED $\langle location \rangle$
    $\vee$ $\wedge$ *vitals* = "normal"
        $\wedge$ *location* = "inside"
        $\wedge$ UNCHANGED $\langle location \rangle$

MedicineTime $\triangleq$
    $\vee$ $\wedge$ *time* $\in$ *medicineTime*
        $\wedge$ *RingAlarm*
        $\wedge$ *time*$'$ = (*time* + 1)%12
    $\vee$ $\wedge$ *time* $\notin$ *medicineTime*
        $\wedge$ *time*$'$ = (*time* + 1)%12

Next $\triangleq$
    $\wedge$ *CheckVitals*
    $\wedge$ *MedicineTime*
    $\wedge$ *Alarm*
    $\wedge$ *TypeOK*

Spec $\triangleq$ *Init* $\wedge\ \square[Next]_{Var}$