

Develop a program to calculate and optimize medication dosage schedules for a patient.

Requirements:

Input an array representing the blood drug concentration levels of a patient measured hourly over a day (24 values).

Identify periods where the drug concentration is below the therapeutic range (e.g., 10-20 mg/L) and suggest the best times for administering the next dose to maintain a steady level.

Calculate the average drug concentration and identify any overdosing (levels exceeding 25 mg/L).

Allow the user to simulate an additional dose at a specific hour and observe the predicted levels for the next 12 hours.

Constraints:

Assume a decay factor for drug concentration (e.g., a 20% reduction every hour).

Ensure user-simulated dosing does not lead to overdose.

```
#include <stdio.h>
```

```
#define HOURS 24
```

```
#define THERAPEUTIC_MIN 10
```

```
#define THERAPEUTIC_MAX 20
```

```
#define OVERDOSE_LIMIT 25
```

```
#define DECAY 0.8
```

```
void analyze(double levels[], double *avg, int *below, int *overdose) {
```

```
    double sum = 0;
```

```
    for (int i = 0; i < HOURS; i++) {
```

```
        sum += levels[i];
```

```
        if (levels[i] < THERAPEUTIC_MIN) (*below)++;
```

```
        if (levels[i] > OVERDOSE_LIMIT) (*overdose)++;
```

```
    }
```

```
    *avg = sum / HOURS;
```

```
}
```

```
void suggestDosingTimes(double levels[]) {
```

```
    printf("Suggested dosing times (below therapeutic range): ");
```

```
    for (int i = 0; i < HOURS; i++) {
```

```

        if (levels[i] < THERAPEUTIC_MIN) printf("%d ", i);
    }
    printf("\n");
}

void simulateDose(double levels[], double dose, int hour) {
    double simulated[HOURS + 12];
    for (int i = 0; i < HOURS; i++) simulated[i] = levels[i];

    // Apply the dose at the specified hour
    simulated[hour] += dose;

    printf("Predicted levels for the next 12 hours after a dose of %.2f at hour %d:\n", dose, hour);
    for (int i = hour + 1; i < hour + 13; i++) {
        simulated[i] = simulated[i - 1] * DECAY; // Apply decay
        printf("Hour %d: %.2f %s\n", i - hour, simulated[i], simulated[i] > OVERDOSE_LIMIT ?
"(Overdose!)" : "");
    }
}

int main() {
    double levels[HOURS], avg;
    int below = 0, overdose = 0, hour;
    double dose;

    printf("Enter drug concentration levels for 24 hours:\n");
    for (int i = 0; i < HOURS; i++) {
        scanf("%lf", &levels[i]); // Input drug concentration for each hour
    }

    // Analyze the levels to calculate average, below therapeutic, and overdose hours

```

```

analyze(levels, &avg, &below, &overdose);

// Print the analysis results
printf("Average concentration: %.2f\n", avg);
printf("Hours below therapeutic range: %d\n", below);
printf("Hours above overdose limit: %d\n", overdose);

suggestDosingTimes(levels);

printf("Enter hour to simulate dose (0-23): ");
scanf("%d", &hour);
if (hour < 0 || hour >= HOURS) {
    printf("Invalid hour. Please enter a value between 0 and 23.\n");
    return 1;
}

printf("Enter dose amount: ");
scanf("%lf", &dose);

// Ensure the dose does not cause overdose immediately
if (levels[hour] + dose > OVERDOSE_LIMIT) {
    printf("Warning: The dose exceeds the overdose limit at this hour!\n");
} else {
    // Simulate the dose and check the predicted levels for the next 12 hours
    simulateDose(levels, dose, hour);
}

return 0;
}

```