HbA1c

Software Documentation

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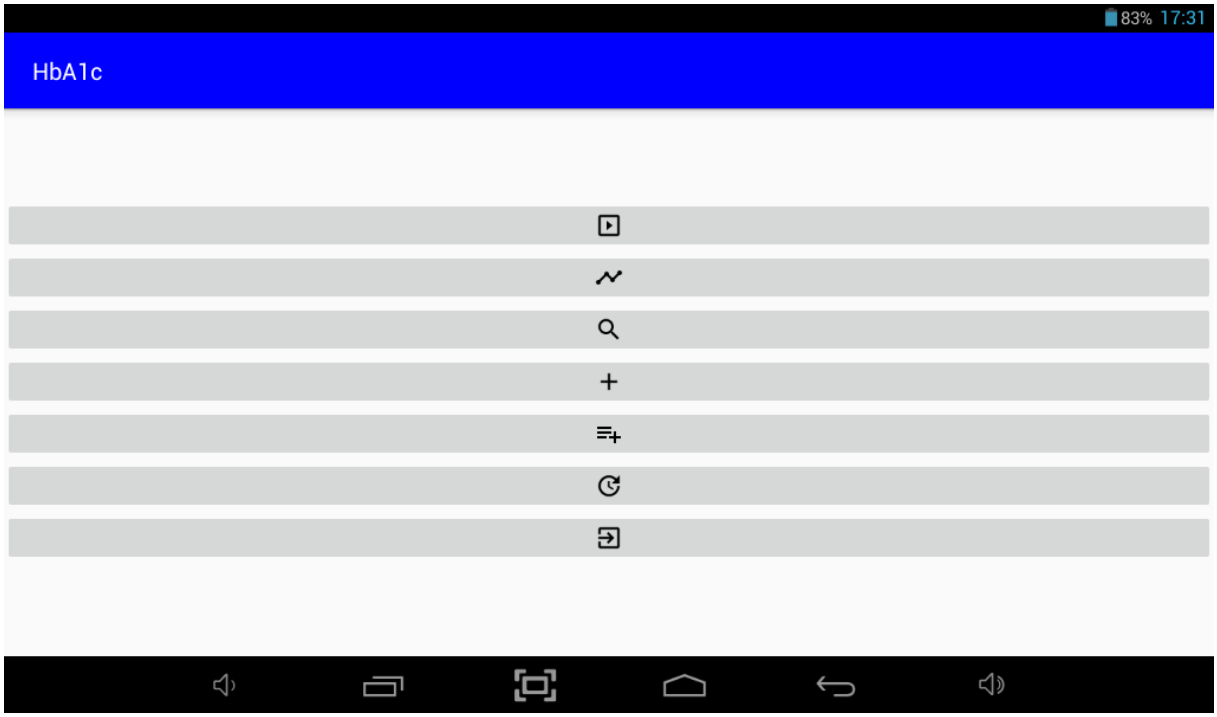
Table of contents

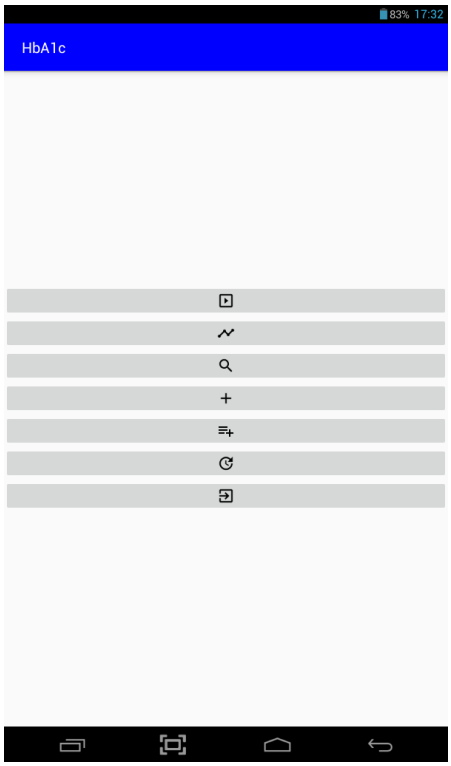
Introduction

This software documentation includes: description of the application's operation, what is needed for use, algorithms used, interface description and source code description. This app is used to monitor glycated hemoglobin levels.

Describing of the application’s operation



Drawing 1: The beginning of the application's operation - horizontal [own study]



Drawing 2: The beginning of the application's operation – vertical [own study]

The application is extended with a database. It has the ability to monitor the approximate and indicative value of glycosylated hemoglobin (HbA1c) on the basis of six samples of blood glucose concentration in mg / dL for one day, covering a period of 90 days, or 3 months, because this is the average lifetime of red blood cells.

Sample schedule of samples per day wage:

6am - on an empty stomach or before breakfast

8am - 2 hours after breakfast

12pm - before dinner

2pm - 2 hours after lunch

18pm - before dinner

21pm - 3 hours after dinner or before bedtime

Sequentially from the top, using the buttons, the user can:

1) View statistics and all samples

2) see your progress and the effects of self-control

3) search for a specific value or in a given range of values with an address

4) add a single day's work, i.e. 6 samples

5) Add a single week, which is 6 samples x 7 days = 42 samples

6) Update single sample based on address

7) exit the application

It is worth starting the description of the application's functions by adding new samples for the whole week, where the user can choose which day is the first and enter its date or for one day.

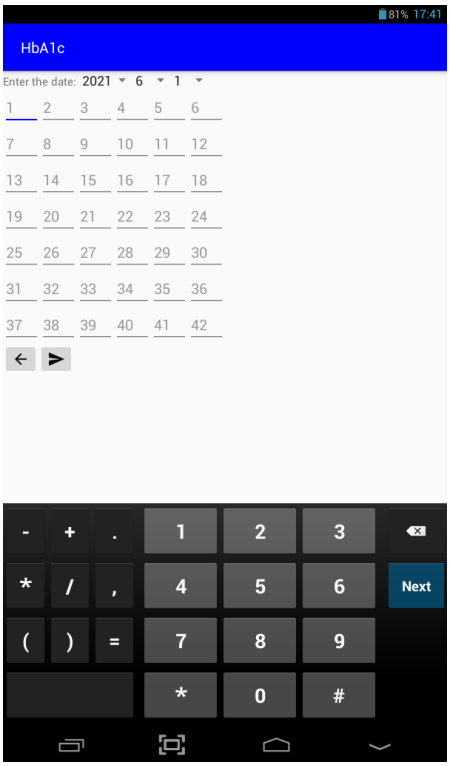
The argument is that in order to display statistics and all samples (option 1) and update the sample based on ordinal (address) (option 6) the program unexpectedly exits to these options. This means that 540 samples must be introduced at the very beginning of the application's use, i.e. less than 13 weeks (exactly 12 weeks and 6 days).

Adding is done by selecting a date for the first day of the whole week or seven days. The user then enters the values. It is worth remembering that one day's pay is one line. For this purpose, the text fields are numbered sequentially.

Drawing 3: Interface for adding samples for the whole week - horizontal part 1 [own study]

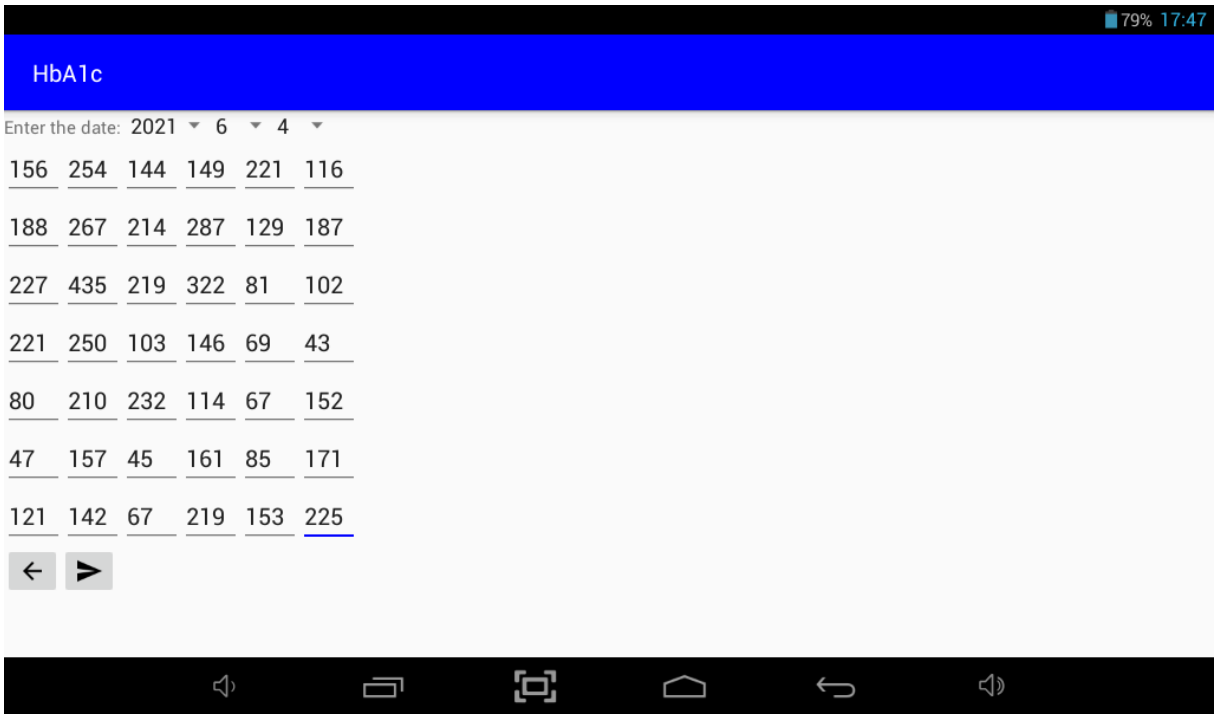
Drawing 4: Interface for adding samples for the whole week - horizontal part 2 [own study]

Drawing 5: Interface for adding samples for the whole week - vertical part 1 [own study]

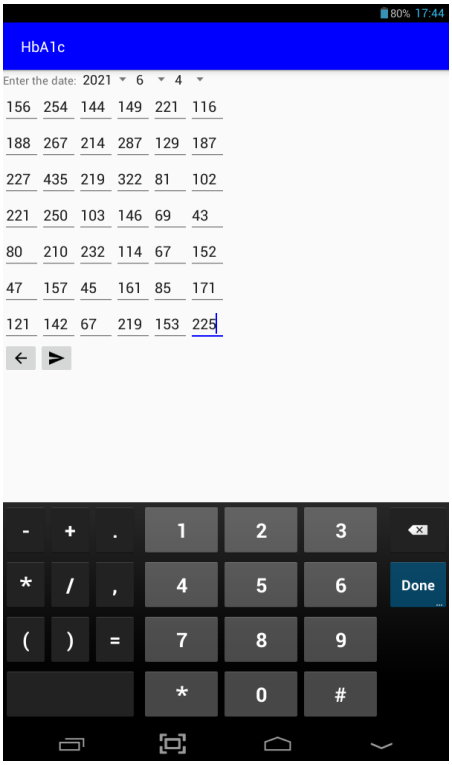


Drawing 6: Interface for adding samples for the whole week - vertical part 2 [own study]

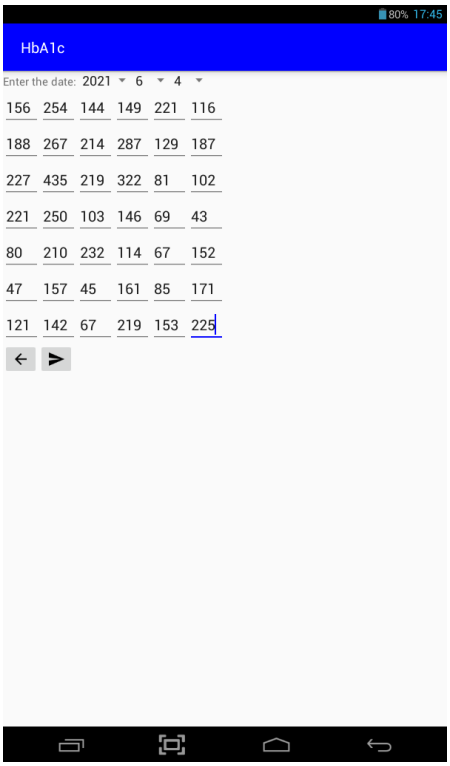
Drawing 7: Values entered – horizontal part 1 [own study]



Drawing 8: Values entered – horizontal part 2 [own study]



Drawing 9: Values entered – vertical part 1 [own study]



Drawing 10: Values entered – vertical part 2 [own study]

The second way to enter data is to add 6 samples for one day.

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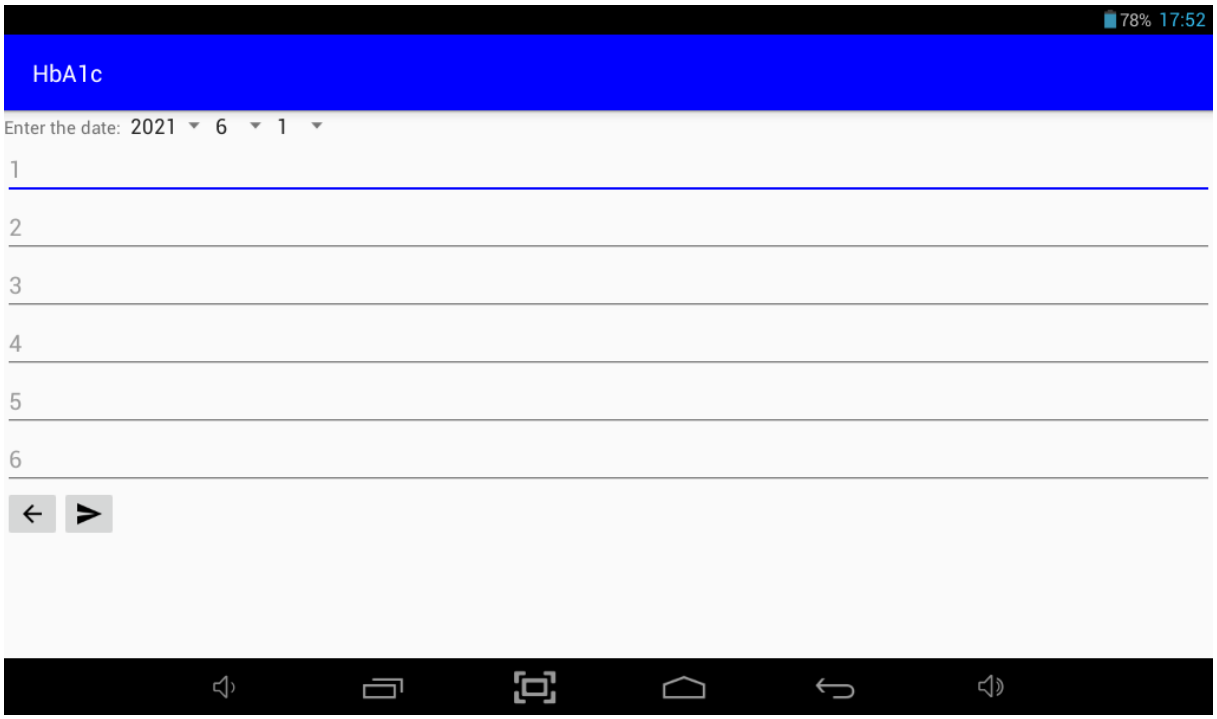
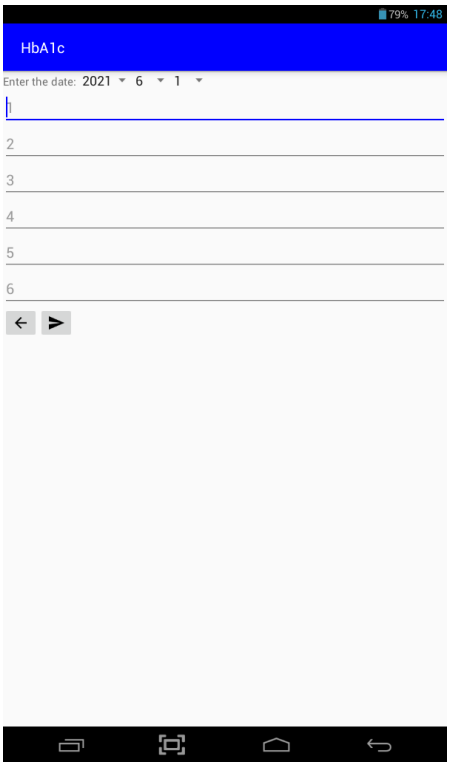
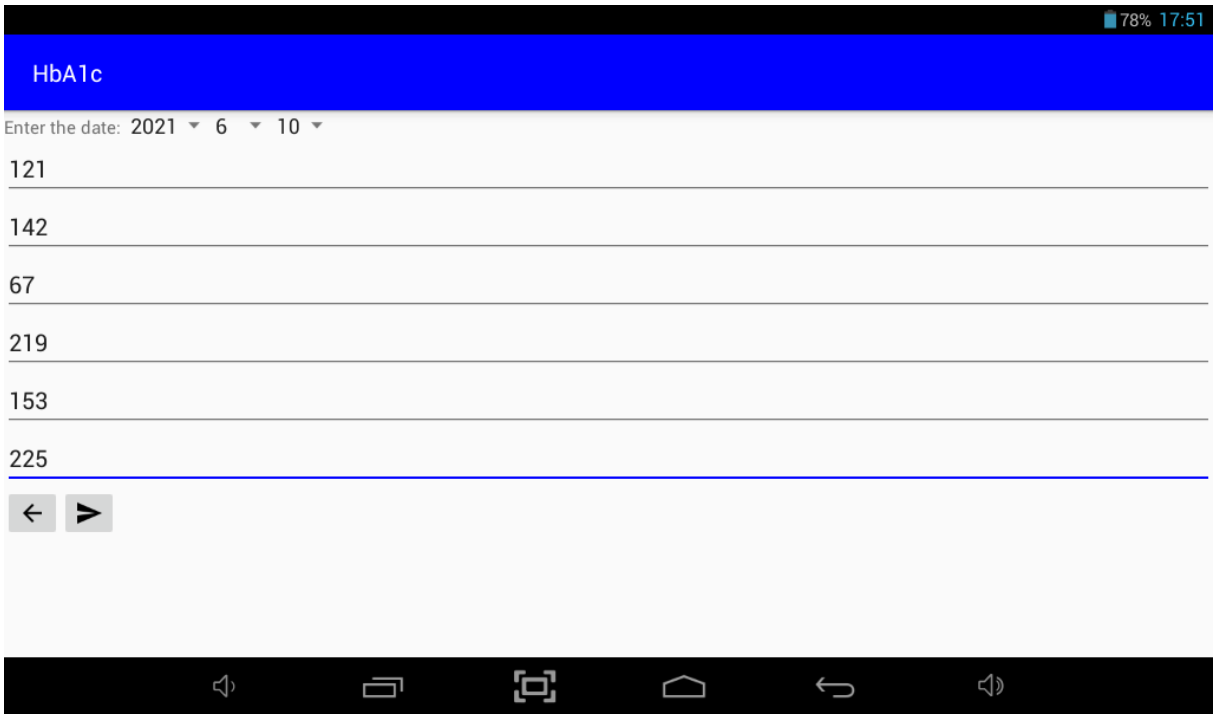


Drawing 11: Interface for adding samples for the one day - horizontal [own study]

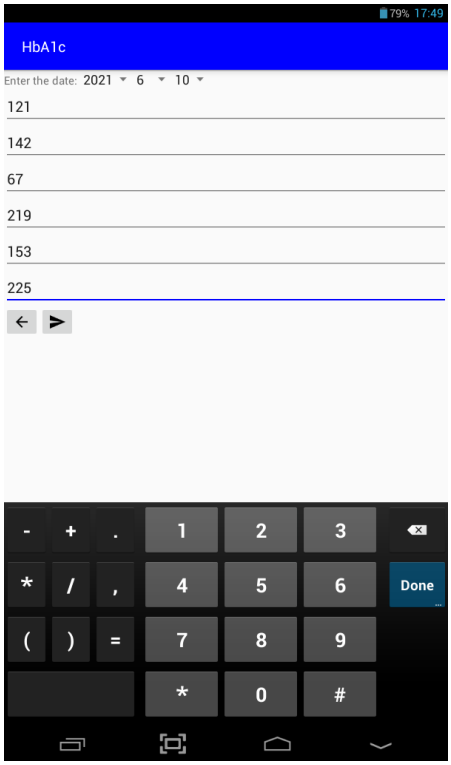


Drawing 12: Interface for adding samples for the one day - vertical [own study]

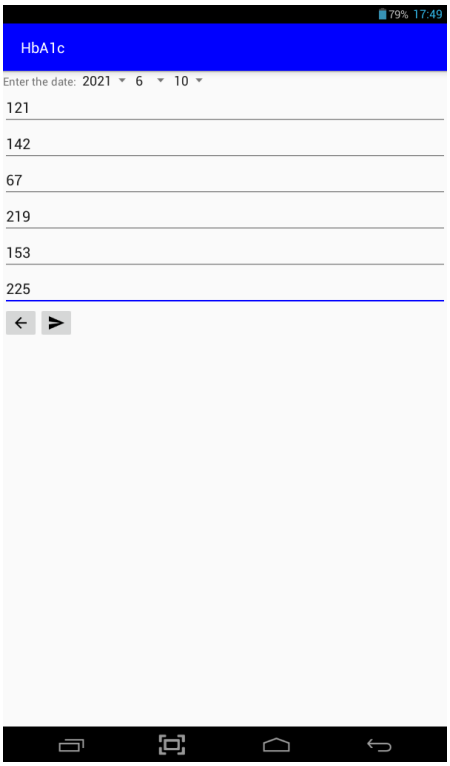
Drawing 13: Values entered – horizontal part 1 [own study]



Drawing 14: Values entered – horizontal part 2 [own study]

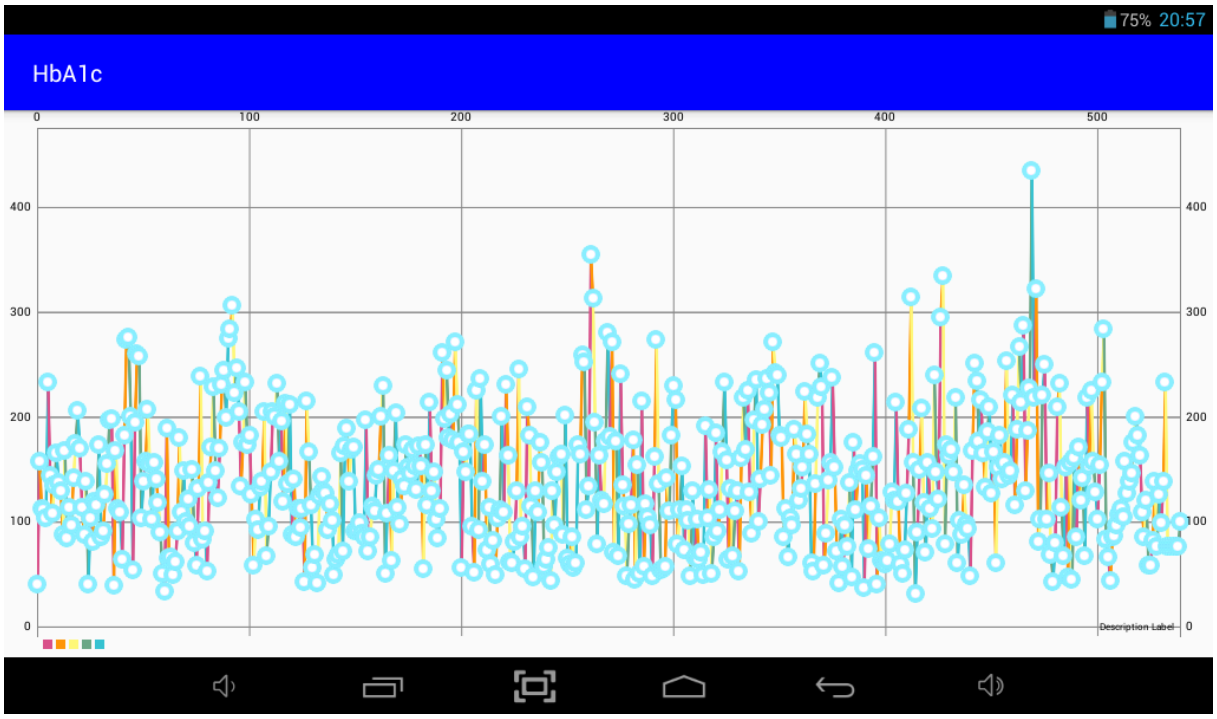


Drawing 15: Values entered – vertical part 1 [own study]

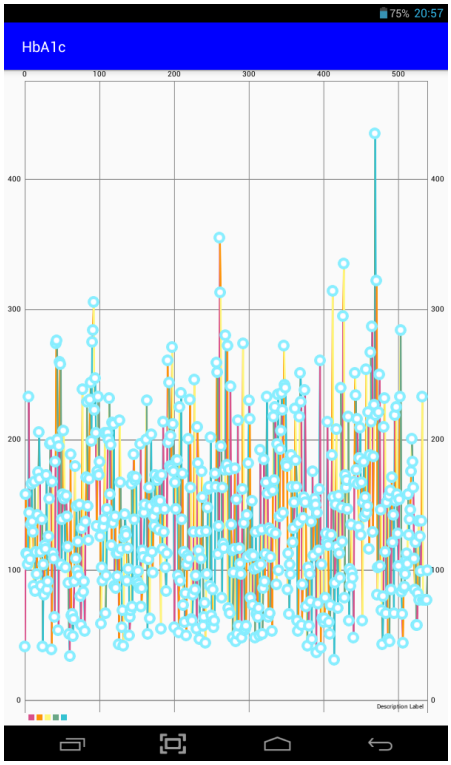


Drawing 16: Values entered – vertical part 2 [own study]

The next step is to discuss the graph display for all 540 samples. This topic requires no further consideration. There must be values to be able to display them.



Drawing 17: Chart - horizontal[own study]

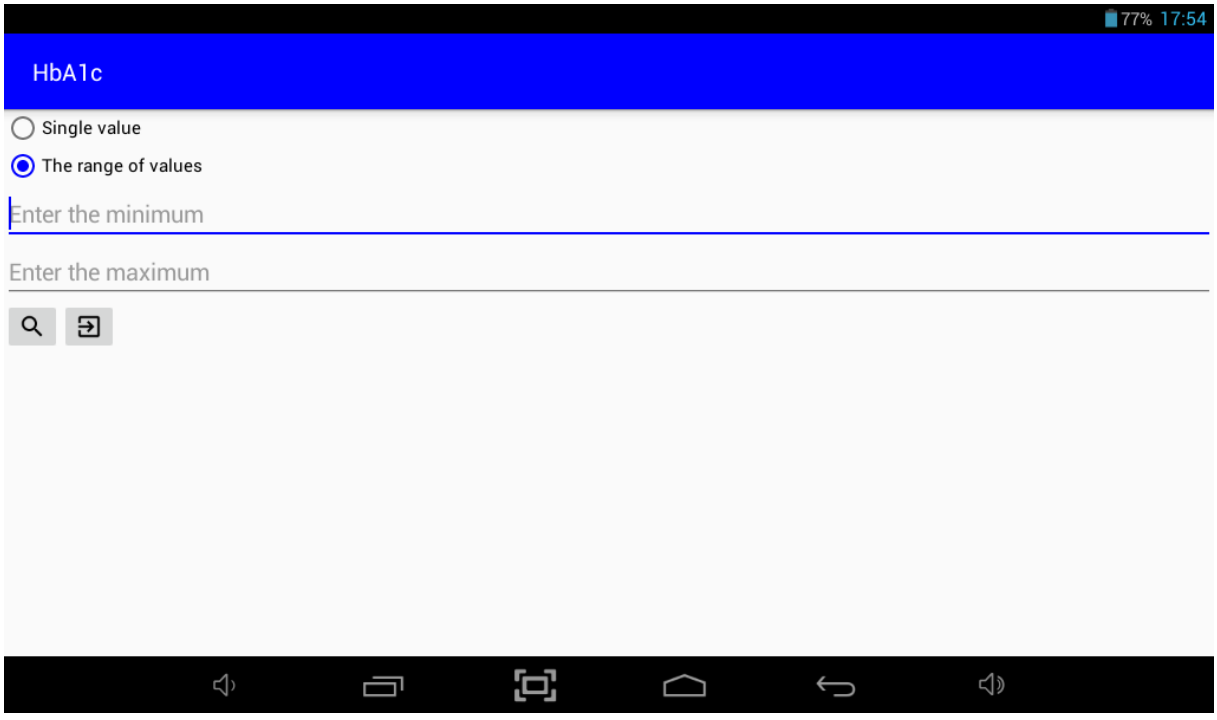


Drawing 18: Chart - vertical [own study]

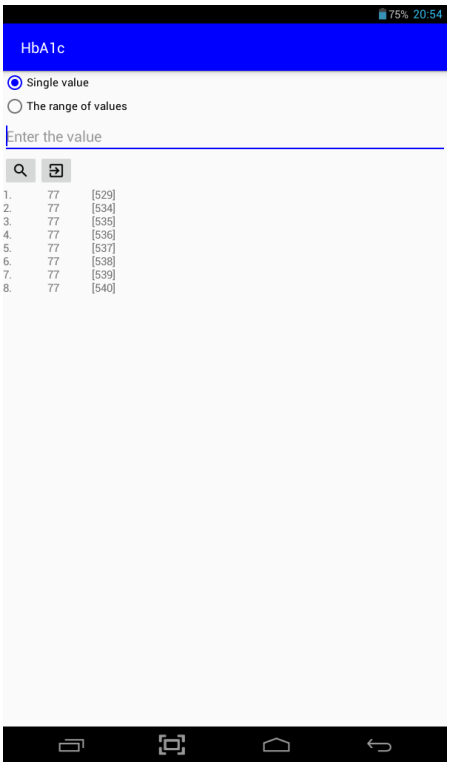
Although it is vertical, it is recommended to display the horizontal graph, which is more readable.

Sometimes a useful function is to find a specific value or set within a given range. Just select the appropriate option and enter the data you are looking for.

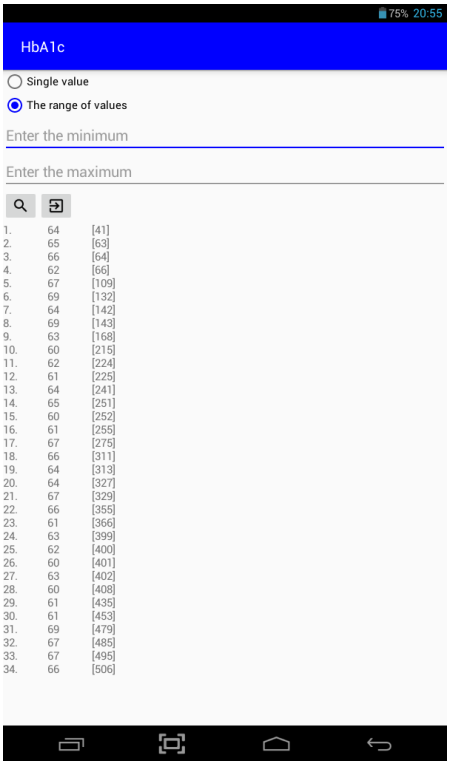
Drawing 19: Interface for searching for a single value [own study]



Drawing 20: Interface for looking up a range of values [own study]

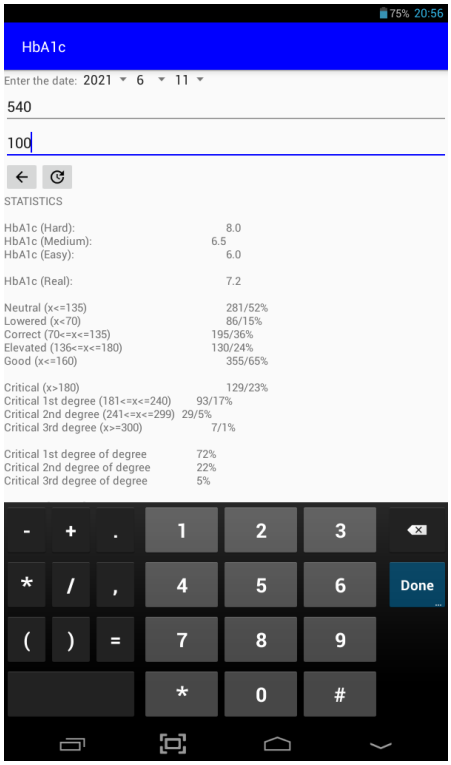


Drawing 21: Example of looking for a value 77 [own study]



Drawing 22: An example of looking for a value between 60 and 69 [own study]

Before the last step, there is an overview of the sample update interface. The user sets the appropriate date, then enters the sample identification address in the first text box from the top. Finally, he introduces a new value.



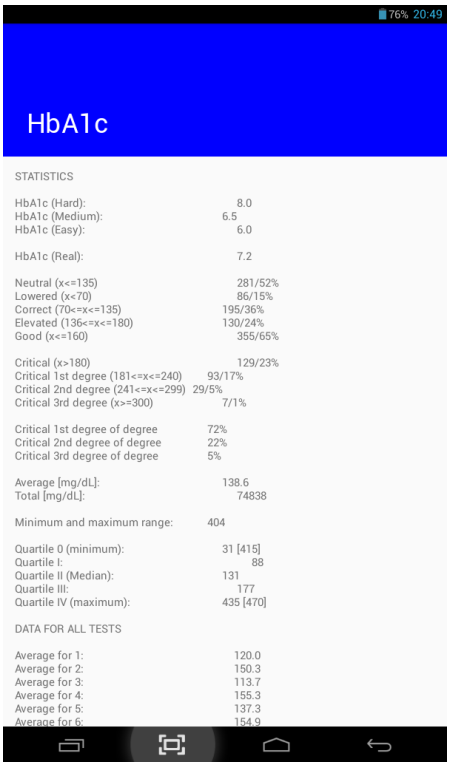
Drawing 23: Sample update interface [own study]

Below the edit fields there is an overview of the current statistics and all sample values, which is the same as in the interface displaying only the statistics and values of all samples.

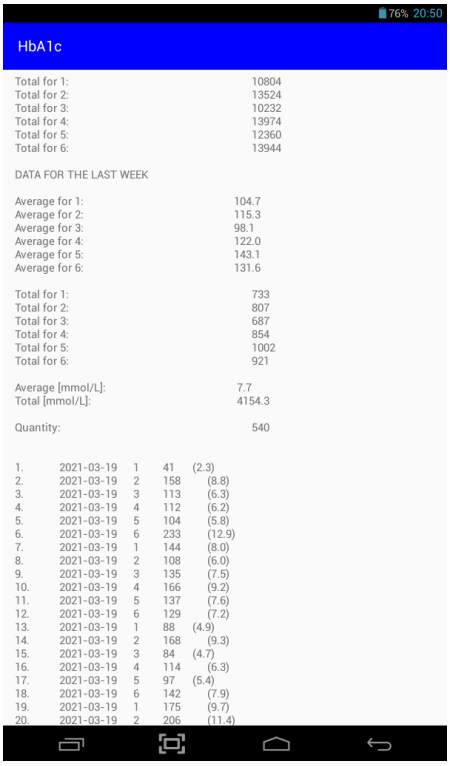
The last interface to discuss is the one that displays the statistics and values of all samples. As with the single sample update interface, the statistics show the approximate value of HbA1c for the lower (raw) and upper (reduced) range, as well as a target approximation that determines the approximate value of this parameter. There is also the real value according to the formula: the sum of the raw scale and the target divided by two. There are number of occurrences statistics in units and percentages for value data ranges. For critical values, the number of occurrences in the set of critical results in the set of critical results taken together is additionally given. Quartiles are also shown. Times of day counts and averages for the entire harvest and the last week are also displayed. When displaying the results, there is a serial number, date, time of day, value in mg / dL and mmol / L.

1 mg / dL = 0.0555 mmol / L

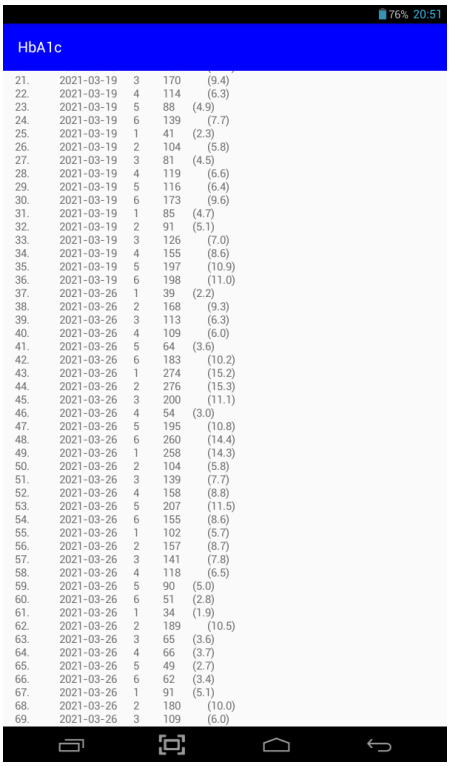
1 mmol / l = 18 mg / dl



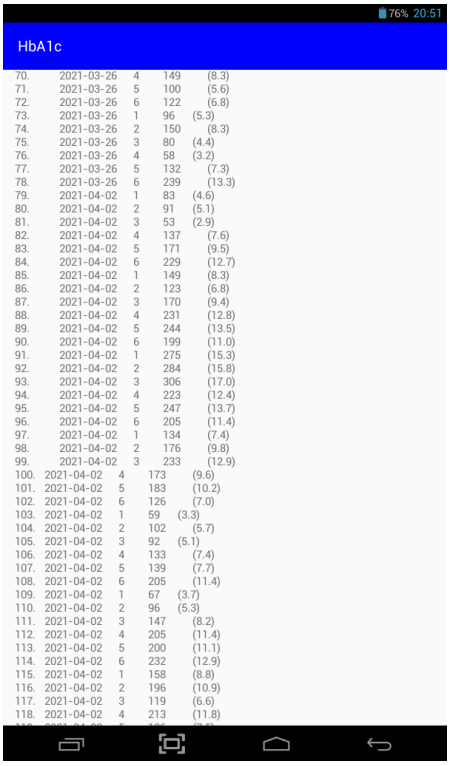
Drawing 24: Data display part 1 [own study]



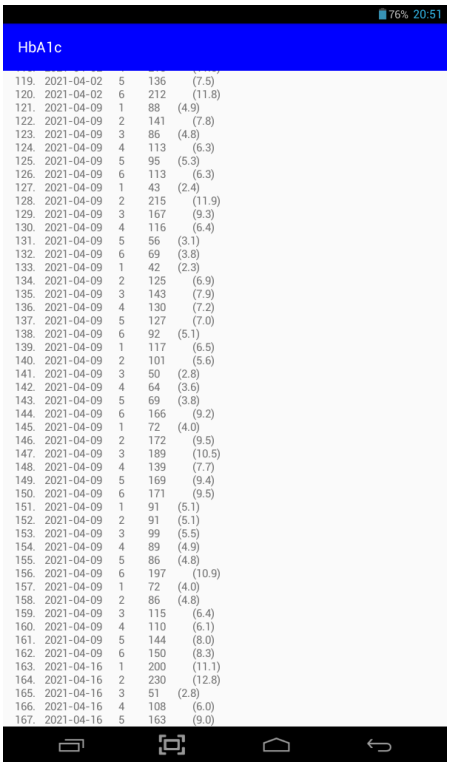
Drawing 25: Data display part 2 [own study]



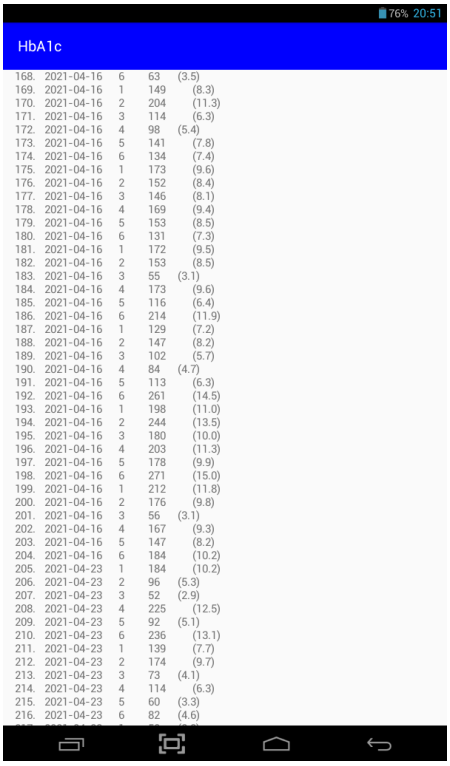
Drawing 26: Data display part 3 [own study]



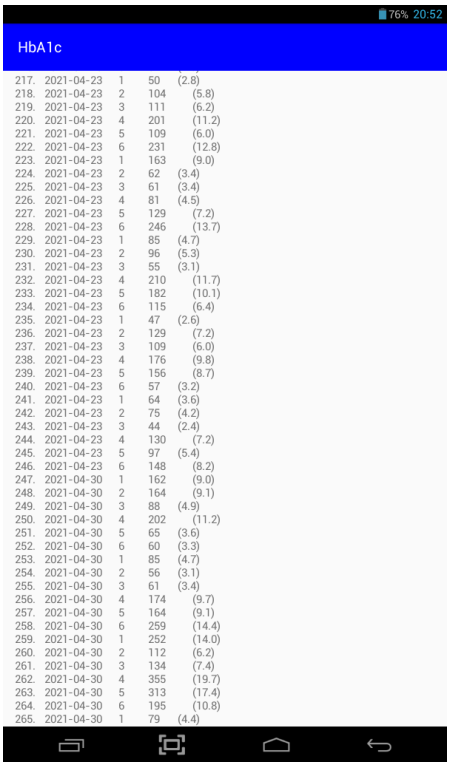
Drawing 27: Data display part 4 [own study]



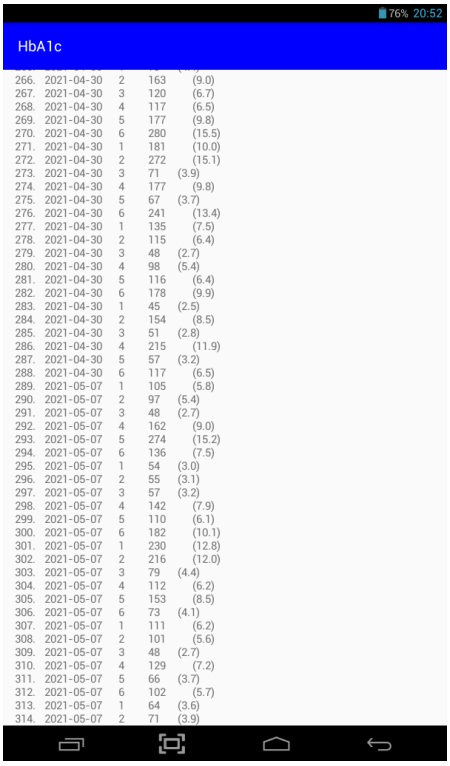
Drawing 28: Data display part 5 [own study]



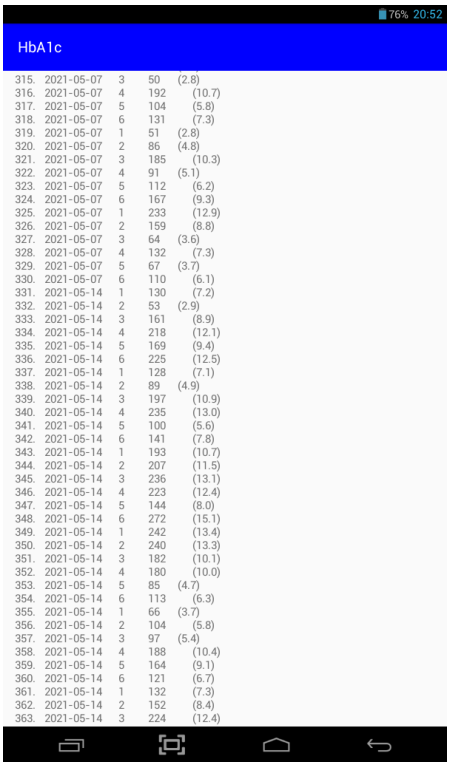
Drawing 29: Data display part 6 [own study]



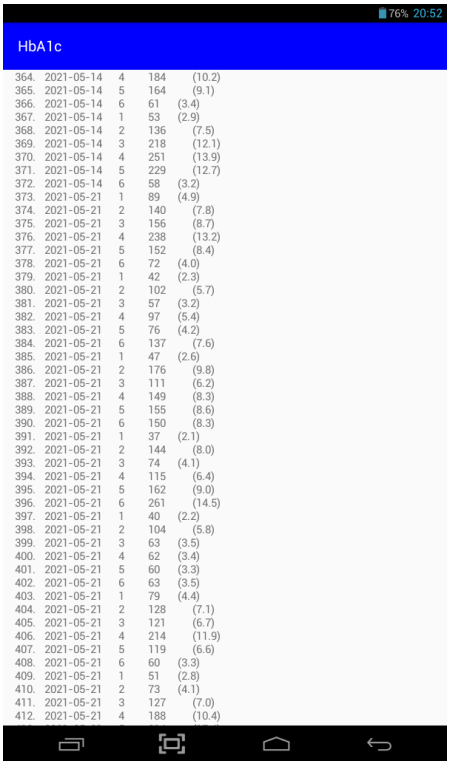
Drawing 30: Data display part 7 [own study]



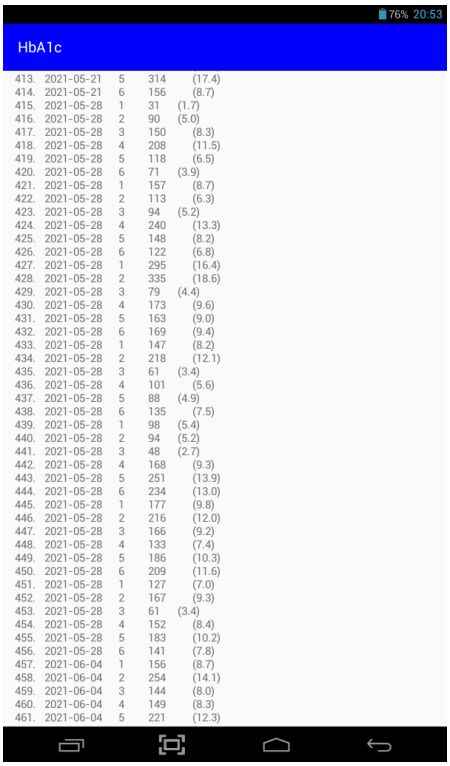
Drawing 31: Data display part 8 [own study]



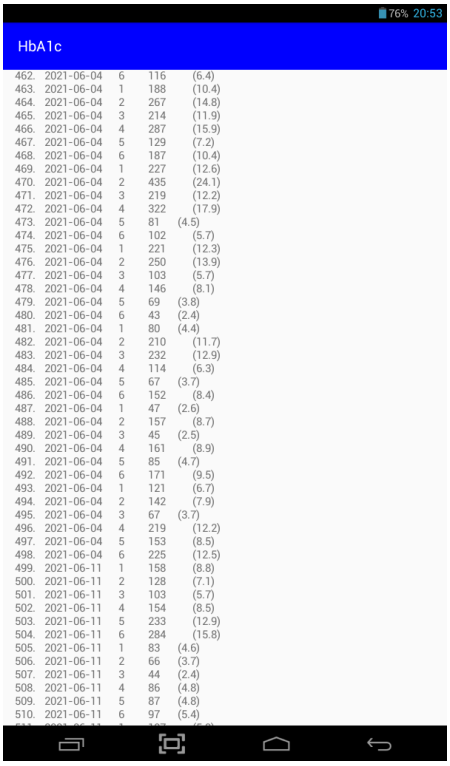
Drawing 32: Data display part 9 [own study]



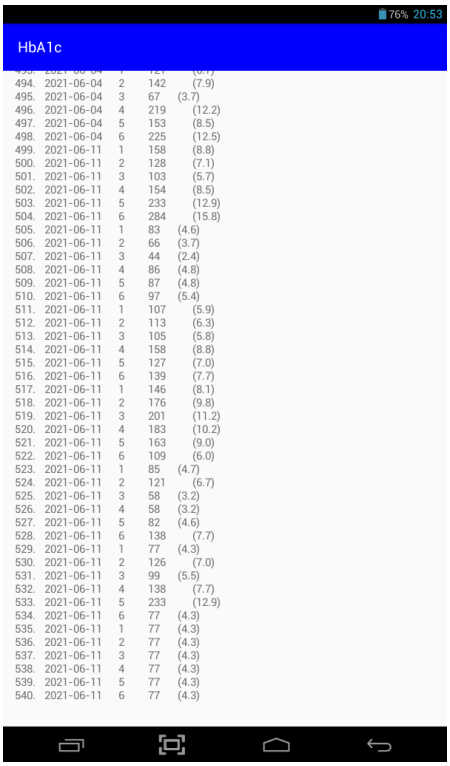
Drawing 33: Data display part 10 [own study]



Drawing 34: Data display part 11 [own study]



Drawing 35: Data display part 12 [own study]



Drawing 36: Data display part 13 [own study]

This is the correct use of the program. Errors detected during testing concern, in addition to the set of 540 samples for the option to display statistics and all samples, as well as updating the sample, make you vigilant to fill in the text fields correctly. It is worth mentioning about setting dates from the drop-down lists, which reset when you change the screen orientation. There may be coding errors that have not been detected by the developer.

What is needed for use?

The application requires installation on the Android operating system with a minimum API level Android 4.0 (IceCreamSandwich), i.e. on all mobile devices with this system.

Algorithm used

Glycated hemoglobin (also known as glycohemoglobin, GHB) is the result of glycation of globin, which is the basic constituent of hemoglobin.

There are different fractions of glycated hemoglobin, but only the HbA1C fraction has been used in the diagnosis of diabetes. A content of 6.5% is synonymous with a diagnosis of diabetes. It is formed by attaching a glucose molecule to the N-terminal amino group of the β-globin chain.

Since the erythrocyte membrane is permeable to glucose, the amount of glycosylated hemoglobin it contains reflects the average blood glucose concentration over the previous 120 days (i.e. the average lifetime of the erythrocyte). It is a useful retrospective glycemic index because there is an association between glycohemoglobin and mean glycaemia and the risk of developing chronic diabetic complications.[1]

HbA_{1c} (%)	Średnie stężenie glukozy w surowicy mg% (mmol/l)
6	126 (7,0)
7	154 (8,6)
8	183 (10,2)
9	212 (11,8)
10	240 (13,4)
11	269 (14,9)
12	298 (16,5)

Drawing 37: Relationship of mean glycaemia in the period of 3 months with HbA1c [1]

The interpretation of the result and the standard of this test is determined by periodically developed expert recommendations that are published by scientific societies (in Poland, the Polish Diabetes Association, in the world the American Diabetes Association). The normal level of HbA1c in a healthy person is around 5%. For people with diabetes, PTD recommends that this result be equal to or below 6.1% -6.5%. According to the detailed PTD recommendations from 2010, the target level of HbA1c should be:

- ≤ 6.5% in patients with type 1 and type 2 diabetes mellitus short-term disease
- ≤ 6.1% in gestational diabetes[1]

HbA1c	Diagnoza
< 5,7%	Norma
5,7 - 6,4%	Stan przedcukrzycowy
> 6,5%	Cukrzyca

Drawing 38: Diagnosing diabetes based on HbA1c [1]

Due to the different determination methods, the threshold value may differ between laboratories and depends on the determination method used.

Elevated levels of glycated hemoglobin indicate poor diabetes control, which is associated with an increased risk of developing diabetes complications. The higher the level of glycosylated hemoglobin, the greater the risk of developing these complications.

HbA1C testing can give you unbelievable results:

- in the presence of the aldimine form HbA1C in the blood
- with variants of hemoglobin produced under the influence of drugs, alcohol and uremia
- in hemoglobinopathies
- with a shorter survival time of red blood cells (e.g. haemolytic anemia)
- in hypertriglyceridemia, in hyperbilirubinemia

Glycated hemoglobin testing should be performed every 3 months, and once every six months in the case of a stable disease course and good metabolic control.[1]

HbA_{1c} (%)	Średnie stężenie glukozy w osoczu	
	[mg/dl]*	[mmol/l]**
5	97 (76–120)	5,4 (4,2–6,7)
6	126 (100–152)	7,0 (5,5–8,5)
7	154 (123–185)	8,6 (6,8–10,3)
8	183 (147–217)	10,2 (8,1–12,1)
9	212 (170–249)	11,8 (9,4–13,9)
10	240 (193–282)	13,4 (10,7–15,7)
11	269 (217–314)	14,9 (12,0–17,5)
12	298 (240–347)	16,5 (13,3–19,3)

Dane przedstawiono jako 95% CI. *Liniowa regresja średniego stężenia glukozy [mg/dl] = 28,7 × HbA_{1c} – 46,7. **Liniowa regresja średniego stężenia glukozy [mmol/l] = 1,5944 × HbA_{1c} – 2,5944 (wg Diabetes Care 2008; 31: 1473–1478)

Drawing 39: Relationship between the percentage of HbA1c and mean plasma glucose concentration [2]

When creating the application, three HbA1c ranges from the figure above were followed:

1) Upper (Raw) - the lower range in parenthesis

2) Optimal - in front of the parenthesis

3) Lower (Reduced) - the upper range from the parenthesis

Interface description

The graphical interface is typical of the Android mobile operating system. They are ImageButton, EditText, TextView, RadioButton, Spinner. There is also an interface from the chart. The rest of the information has already been described previously in Describing of the application's operation.

Source code description

The project was made in the Java programming language, in the Android Studio programming environment. All work was done on the Windows 10 operating system. The application's source code looks like this.

```
package com.example.hba1c;

import androidx.appcompat.app.AppCompatActivity;

import android.os.Bundle;
import android.view.View;
import android.widget.EditText;
import android.widget.ImageButton;
import android.widget.Spinner;

import java.util.Calendar;
import java.util.List;
import java.util.ArrayList;
import android.widget.ArrayAdapter;
import android.database.Cursor;
import android.widget.AdapterView.OnItemSelectedListener;
import android.widget.AdapterView;
import android.widget.Toast;


public class AddOneDay extends AppCompatActivity {
    private Spinner sy,sm,sd;
    private EditText et1,et2,et3,et4,et5,et6;
    private ImageButton imgbtnsend,imgbtnback;
    DatabaseManager dm;
    Cursor k;
```

```
    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_add_one_day);

        initializecomponents();
        insertrecords();
        currentDate();
    }

    private void initializecomponents(){
        dm=new DatabaseManager(getApplicationContext());
        k=dm.giveAllTheTests();
        sy=findViewById(R.id.syear);
        sy.setOnItemSelectedListener(new OnItemSelectedListener()
        {
            public void onItemSelected(AdapterView<?> parent, View
view, int position, long id)
            {
                /*String selectedItem =
parent.getItemAtPosition(position).toString();
                if(selectedItem.equals("2"))
                {
                    // do your stuff
                }*/
                insertrecords2();
            } // to close the onItemSelected
            public void onNothingSelected(AdapterView<?> parent)
            {

            }
        });
        sm=findViewById(R.id.smonth);
        sm.setOnItemSelectedListener(new OnItemSelectedListener()
        {
            public void onItemSelected(AdapterView<?> parent, View
view, int position, long id)
            {
                /*String selectedItem =
parent.getItemAtPosition(position).toString();
                if(selectedItem.equals("2"))
                {
                    // do your stuff
                }*/
                insertrecords2();
            } // to close the onItemSelected
            public void onNothingSelected(AdapterView<?> parent)
            {
```

```
            }
        });
        sd=findViewById(R.id.sday);
        et1=findViewById(R.id.et1);
        et2=findViewById(R.id.et2);
        et3=findViewById(R.id.et3);
        et4=findViewById(R.id.et4);
        et5=findViewById(R.id.et5);
        et6=findViewById(R.id.et6);
        imgbtnsend=findViewById(R.id.imgbtnsend);
        imgbtnsend.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
                if(et1.getText().toString().length()>0 &&
et2.getText().toString().length()>0 &&
                        et3.getText().toString().length()>0 &&
et4.getText().toString().length()>0 &&
                        et5.getText().toString().length()>0 &&
et6.getText().toString().length()>0) {
                    String date = sy.getSelectedItem().toString() +
"-";
                    if (sm.getSelectedItem().toString().length() <
2)
                        date = date + "0" +
sm.getSelectedItem().toString() + "-";
                    else date = date +
sm.getSelectedItem().toString() + "-";
                    if (sd.getSelectedItem().toString().length() <
2)
                        date = date + "0" +
sd.getSelectedItem().toString();
                    else date = date +
sd.getSelectedItem().toString();
                    int j = 1;
                    while (k.moveToNext()) {
                        if (j > 6)
                            dm.updateTest(j - 6, k.getString(1),
k.getString(3), k.getString(4));
                        if (j >= 535) {
                            switch (j) {
                                case 535: {
                                    dm.updateTest(j, date,
et1.getText().toString(), String.format("%.1f",
Double.parseDouble(et1.getText().toString()) * 0.0555));
                                    break;
                                }
                                case 536: {
```

```
                                    dm.updateTest(j, date,
et2.getText().toString(), String.format("%.1f",
Double.parseDouble(et2.getText().toString()) * 0.0555));
                                    break;
                                }
                                case 537: {
                                    dm.updateTest(j, date,
et3.getText().toString(), String.format("%.1f",
Double.parseDouble(et3.getText().toString()) * 0.0555));
                                    break;
                                }
                                case 538: {
                                    dm.updateTest(j, date,
et4.getText().toString(), String.format("%.1f",
Double.parseDouble(et4.getText().toString()) * 0.0555));
                                    break;
                                }
                                case 539: {
                                    dm.updateTest(j, date,
et5.getText().toString(), String.format("%.1f",
Double.parseDouble(et5.getText().toString()) * 0.0555));
                                    break;
                                }
                                case 540: {
                                    dm.updateTest(j, date,
et6.getText().toString(), String.format("%.1f",
Double.parseDouble(et6.getText().toString()) * 0.0555));
                                    break;
                                }
                            }
                        }
                        j++;
                    }
                    finish();
                }else Toast.makeText(getApplicationContext(),"Enter
all data",Toast.LENGTH_LONG).show();
            }
        });
        imgbtnback=findViewById(R.id.imgbtnback);
        imgbtnback.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
                finish();
            }
        });
    }

    private void insertrecords(){
        List<String> y = new ArrayList<String>();
```

```
        for(int i=1960;i<=2094;i++) y.add(Integer.toString(i));
        ArrayAdapter<String> dataAdapter = new
ArrayAdapter<String>(this, android.R.layout.simple_spinner_item, y);

dataAdapter.setDropDownViewResource(android.R.layout.simple_spinner_
dropdown_item);
        sy.setAdapter(dataAdapter);

        List<String> m=new ArrayList<String>();
        for(int i=1;i<=12;i++) m.add(Integer.toString(i));
        ArrayAdapter<String> dataAdapter2 = new
ArrayAdapter<String>(this, android.R.layout.simple_spinner_item, m);

dataAdapter2.setDropDownViewResource(android.R.layout.simple_spinner
_dropdown_item);
        sm.setAdapter(dataAdapter2);

        insertrecords2();
    }

    private void insertrecords2(){
        int max=0;

if(sm.getSelectedItem().equals("1")||sm.getSelectedItem().equals("3"
)||sm.getSelectedItem().equals("5")||

sm.getSelectedItem().equals("7")||sm.getSelectedItem().equals("8")||

sm.getSelectedItem().equals("10")||sm.getSelectedItem().equals("12")
) max=31;
        else
if(sm.getSelectedItem().equals("4")||sm.getSelectedItem().equals("6"
)||

sm.getSelectedItem().equals("9")||sm.getSelectedItem().equals("11"))
max=30;
        else {

if((Integer.parseInt(sy.getSelectedItem().toString())%4==0 &&
            Integer.parseInt(sy.getSelectedItem().toString())!=0)||

Integer.parseInt(sy.getSelectedItem().toString())%400==0) max=29;
            else max=28;
        }
        List<String> d=new ArrayList<String>();
        for(int i=1;i<=max;i++) d.add(Integer.toString(i));
        ArrayAdapter<String> dataAdapter3 = new
ArrayAdapter<String>(this, android.R.layout.simple_spinner_item, d);
```

```
dataAdapter3.setDropDownViewResource(android.R.layout.simple_spinner
_dropdown_item);
        sd.setAdapter(dataAdapter3);
    }

    private void currentDate(){
        Calendar now=Calendar.getInstance();
        sy.setSelection(now.get(Calendar.YEAR)-1960);
        sm.setSelection(now.get(Calendar.MONTH));
        sd.setSelection(now.get(Calendar.DAY_OF_MONTH));
    }
}
```

Listing 1: The source code for AddOneDay.java file [own study]

```
package com.example.hba1c;

import androidx.appcompat.app.AppCompatActivity;

import android.database.Cursor;
import android.os.Bundle;
import android.view.View;
import android.widget.AdapterView;
import android.widget.ArrayAdapter;
import android.widget.EditText;
import android.widget.ImageButton;
import android.widget.Spinner;
import android.widget.Toast;

import java.util.ArrayList;
import java.util.Calendar;
import java.util.List;

public class AddOneWeek extends AppCompatActivity {
    private Spinner sy,sm,sd;
    private EditText et1,et2,et3,et4,et5,et6;
    private EditText et7,et8,et9,et10,et11,et12;
    private EditText et13,et14,et15,et16,et17,et18;
    private EditText et19,et20,et21,et22,et23,et24;
    private EditText et25,et26,et27,et28,et29,et30;
    private EditText et31,et32,et33,et34,et35,et36;
    private EditText et37,et38,et39,et40,et41,et42;
    private ImageButton imgbtnsend,imgbtnback;
    DatabaseManager dm;
    Cursor k;
    @Override
    protected void onCreate(Bundle savedInstanceState) {
```

```
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_add_one_week);

        initializecomponents();
        insertrecords();
        currentDate();
    }

    private void initializecomponents(){
        dm=new DatabaseManager(getApplicationContext());
        k=dm.giveAllTheTests();
        sy=findViewById(R.id.syear);
        sy.setOnItemSelectedListener(new
AdapterView.OnItemSelectedListener()
        {
            public void onItemSelected(AdapterView<?> parent, View
view, int position, long id)
            {
                /*String selectedItem =
parent.getItemAtPosition(position).toString();
                if(selectedItem.equals("2"))
                {
                    // do your stuff
                }*/
                insertrecords2();
            } // to close the onItemSelected
            public void onNothingSelected(AdapterView<?> parent)
            {

            }
        });
        sm=findViewById(R.id.smonth);
        sm.setOnItemSelectedListener(new
AdapterView.OnItemSelectedListener()
        {
            public void onItemSelected(AdapterView<?> parent, View
view, int position, long id)
            {
                /*String selectedItem =
parent.getItemAtPosition(position).toString();
                if(selectedItem.equals("2"))
                {
                    // do your stuff
                }*/
                insertrecords2();
            } // to close the onItemSelected
            public void onNothingSelected(AdapterView<?> parent)
            {
```

```
    }
});
sd=findViewById(R.id.sday);
et1=findViewById(R.id.et1);
et2=findViewById(R.id.et2);
et3=findViewById(R.id.et3);
et4=findViewById(R.id.et4);
et5=findViewById(R.id.et5);
et6=findViewById(R.id.et6);
et7=findViewById(R.id.et7);
et8=findViewById(R.id.et8);
et9=findViewById(R.id.et9);
et10=findViewById(R.id.et10);
et11=findViewById(R.id.et11);
et12=findViewById(R.id.et12);
et13=findViewById(R.id.et13);
et14=findViewById(R.id.et14);
et15=findViewById(R.id.et15);
et16=findViewById(R.id.et16);
et17=findViewById(R.id.et17);
et18=findViewById(R.id.et18);
et19=findViewById(R.id.et19);
et20=findViewById(R.id.et20);
et21=findViewById(R.id.et21);
et22=findViewById(R.id.et22);
et23=findViewById(R.id.et23);
et24=findViewById(R.id.et24);
et25=findViewById(R.id.et25);
et26=findViewById(R.id.et26);
et27=findViewById(R.id.et27);
et28=findViewById(R.id.et28);
et29=findViewById(R.id.et29);
et30=findViewById(R.id.et30);
et31=findViewById(R.id.et31);
et32=findViewById(R.id.et32);
et33=findViewById(R.id.et33);
et34=findViewById(R.id.et34);
et35=findViewById(R.id.et35);
et36=findViewById(R.id.et36);
et37=findViewById(R.id.et37);
et38=findViewById(R.id.et38);
et39=findViewById(R.id.et39);
et40=findViewById(R.id.et40);
et41=findViewById(R.id.et41);
et42=findViewById(R.id.et42);
imgbtnsend=findViewById(R.id.imgbtnsend);
imgbtnsend.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
```

```
                if(et1.getText().toString().length()>0 &&
et2.getText().toString().length()>0 &&
                        et3.getText().toString().length()>0 &&
et4.getText().toString().length()>0 &&
                        et5.getText().toString().length()>0 &&
et6.getText().toString().length()>0) {
                    String date = sy.getSelectedItem().toString() +
"-";
                    if (sm.getSelectedItem().toString().length() <
2)
                        date = date + "0" +
sm.getSelectedItem().toString() + "-";
                    else date = date +
sm.getSelectedItem().toString() + "-";
                    if (sd.getSelectedItem().toString().length() <
2)
                        date = date + "0" +
sd.getSelectedItem().toString();
                    else date = date +
sd.getSelectedItem().toString();
                    int j = 1;
                    while (k.moveToNext()) {
                        if (j > 42)
                            dm.updateTest(j - 42, k.getString(1),
k.getString(3), k.getString(4));
                        if (j >= 499) {
                            switch (j) {
                                case 499: {
                                    dm.updateTest(j, date,
et1.getText().toString(), String.format("%.1f",
Double.parseDouble(et1.getText().toString()) * 0.0555));
                                    break;
                                }
                                case 500: {
                                    dm.updateTest(j, date,
et2.getText().toString(), String.format("%.1f",
Double.parseDouble(et2.getText().toString()) * 0.0555));
                                    break;
                                }
                                case 501: {
                                    dm.updateTest(j, date,
et3.getText().toString(), String.format("%.1f",
Double.parseDouble(et3.getText().toString()) * 0.0555));
                                    break;
                                }
                                case 502: {
                                    dm.updateTest(j, date,
et4.getText().toString(), String.format("%.1f",
Double.parseDouble(et4.getText().toString()) * 0.0555));
```

```
                                    break;
                                }
                                case 503: {
                                    dm.updateTest(j, date,
et5.getText().toString(), String.format("%.1f",
Double.parseDouble(et5.getText().toString()) * 0.0555));
                                    break;
                                }
                                case 504: {
                                    dm.updateTest(j, date,
et6.getText().toString(), String.format("%.1f",
Double.parseDouble(et6.getText().toString()) * 0.0555));
                                    break;
                                }
                                case 505: {
                                    dm.updateTest(j, date,
et7.getText().toString(), String.format("%.1f",
Double.parseDouble(et7.getText().toString()) * 0.0555));
                                    break;
                                }
                                case 506: {
                                    dm.updateTest(j, date,
et8.getText().toString(), String.format("%.1f",
Double.parseDouble(et8.getText().toString()) * 0.0555));
                                    break;
                                }
                                case 507: {
                                    dm.updateTest(j, date,
et9.getText().toString(), String.format("%.1f",
Double.parseDouble(et9.getText().toString()) * 0.0555));
                                    break;
                                }
                                case 508: {
                                    dm.updateTest(j, date,
et10.getText().toString(), String.format("%.1f",
Double.parseDouble(et10.getText().toString()) * 0.0555));
                                    break;
                                }
                                case 509: {
                                    dm.updateTest(j, date,
et11.getText().toString(), String.format("%.1f",
Double.parseDouble(et11.getText().toString()) * 0.0555));
                                    break;
                                }
                                case 510: {
                                    dm.updateTest(j, date,
et12.getText().toString(), String.format("%.1f",
Double.parseDouble(et12.getText().toString()) * 0.0555));
                                    break;
```

```
                                }
                                case 511: {
                                    dm.updateTest(j, date,
et13.getText().toString(), String.format("%.1f",
Double.parseDouble(et13.getText().toString()) * 0.0555));
                                    break;
                                }
                                case 512: {
                                    dm.updateTest(j, date,
et14.getText().toString(), String.format("%.1f",
Double.parseDouble(et14.getText().toString()) * 0.0555));
                                    break;
                                }
                                case 513: {
                                    dm.updateTest(j, date,
et15.getText().toString(), String.format("%.1f",
Double.parseDouble(et15.getText().toString()) * 0.0555));
                                    break;
                                }
                                case 514: {
                                    dm.updateTest(j, date,
et16.getText().toString(), String.format("%.1f",
Double.parseDouble(et16.getText().toString()) * 0.0555));
                                    break;
                                }
                                case 515: {
                                    dm.updateTest(j, date,
et17.getText().toString(), String.format("%.1f",
Double.parseDouble(et17.getText().toString()) * 0.0555));
                                    break;
                                }
                                case 516: {
                                    dm.updateTest(j, date,
et18.getText().toString(), String.format("%.1f",
Double.parseDouble(et18.getText().toString()) * 0.0555));
                                    break;
                                }
                                case 517: {
                                    dm.updateTest(j, date,
et19.getText().toString(), String.format("%.1f",
Double.parseDouble(et19.getText().toString()) * 0.0555));
                                    break;
                                }
                                case 518: {
                                    dm.updateTest(j, date,
et20.getText().toString(), String.format("%.1f",
Double.parseDouble(et20.getText().toString()) * 0.0555));
                                    break;
                                }
```

```
                                case 519: {
                                    dm.updateTest(j, date,
et21.getText().toString(), String.format("%.1f",
Double.parseDouble(et21.getText().toString()) * 0.0555));
                                    break;
                                }
                                case 520: {
                                    dm.updateTest(j, date,
et22.getText().toString(), String.format("%.1f",
Double.parseDouble(et22.getText().toString()) * 0.0555));
                                    break;
                                }
                                case 521: {
                                    dm.updateTest(j, date,
et23.getText().toString(), String.format("%.1f",
Double.parseDouble(et23.getText().toString()) * 0.0555));
                                    break;
                                }
                                case 522: {
                                    dm.updateTest(j, date,
et24.getText().toString(), String.format("%.1f",
Double.parseDouble(et24.getText().toString()) * 0.0555));
                                    break;
                                }
                                case 523: {
                                    dm.updateTest(j, date,
et25.getText().toString(), String.format("%.1f",
Double.parseDouble(et25.getText().toString()) * 0.0555));
                                    break;
                                }
                                case 524: {
                                    dm.updateTest(j, date,
et26.getText().toString(), String.format("%.1f",
Double.parseDouble(et26.getText().toString()) * 0.0555));
                                    break;
                                }
                                case 525: {
                                    dm.updateTest(j, date,
et27.getText().toString(), String.format("%.1f",
Double.parseDouble(et27.getText().toString()) * 0.0555));
                                    break;
                                }
                                case 526: {
                                    dm.updateTest(j, date,
et28.getText().toString(), String.format("%.1f",
Double.parseDouble(et28.getText().toString()) * 0.0555));
                                    break;
                                }
                                case 527: {
```

```
                                    dm.updateTest(j, date,
et29.getText().toString(), String.format("%.1f",
Double.parseDouble(et29.getText().toString()) * 0.0555));
                                    break;
                                }
                                case 528: {
                                    dm.updateTest(j, date,
et30.getText().toString(), String.format("%.1f",
Double.parseDouble(et30.getText().toString()) * 0.0555));
                                    break;
                                }
                                case 529: {
                                    dm.updateTest(j, date,
et31.getText().toString(), String.format("%.1f",
Double.parseDouble(et31.getText().toString()) * 0.0555));
                                    break;
                                }
                                case 530: {
                                    dm.updateTest(j, date,
et32.getText().toString(), String.format("%.1f",
Double.parseDouble(et32.getText().toString()) * 0.0555));
                                    break;
                                }
                                case 531: {
                                    dm.updateTest(j, date,
et33.getText().toString(), String.format("%.1f",
Double.parseDouble(et33.getText().toString()) * 0.0555));
                                    break;
                                }
                                case 532: {
                                    dm.updateTest(j, date,
et34.getText().toString(), String.format("%.1f",
Double.parseDouble(et34.getText().toString()) * 0.0555));
                                    break;
                                }
                                case 533: {
                                    dm.updateTest(j, date,
et35.getText().toString(), String.format("%.1f",
Double.parseDouble(et35.getText().toString()) * 0.0555));
                                    break;
                                }
                                case 534: {
                                    dm.updateTest(j, date,
et36.getText().toString(), String.format("%.1f",
Double.parseDouble(et36.getText().toString()) * 0.0555));
                                    break;
                                }
                                case 535: {
```

```
                                    dm.updateTest(j, date,
et37.getText().toString(), String.format("%.1f",
Double.parseDouble(et37.getText().toString()) * 0.0555));
                                    break;
                                }
                                case 536: {
                                    dm.updateTest(j, date,
et38.getText().toString(), String.format("%.1f",
Double.parseDouble(et38.getText().toString()) * 0.0555));
                                    break;
                                }
                                case 537: {
                                    dm.updateTest(j, date,
et39.getText().toString(), String.format("%.1f",
Double.parseDouble(et39.getText().toString()) * 0.0555));
                                    break;
                                }
                                case 538: {
                                    dm.updateTest(j, date,
et40.getText().toString(), String.format("%.1f",
Double.parseDouble(et40.getText().toString()) * 0.0555));
                                    break;
                                }
                                case 539: {
                                    dm.updateTest(j, date,
et41.getText().toString(), String.format("%.1f",
Double.parseDouble(et41.getText().toString()) * 0.0555));
                                    break;
                                }
                                case 540: {
                                    dm.updateTest(j, date,
et42.getText().toString(), String.format("%.1f",
Double.parseDouble(et42.getText().toString()) * 0.0555));
                                    break;
                                }
                            }
                        }
                        j++;
                    }
                    finish();
                }else Toast.makeText(getApplicationContext(),"Enter
all data",Toast.LENGTH_LONG).show();
            }
        });
        imgbtnback=findViewById(R.id.imgbtnback);
        imgbtnback.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
                finish();
```

```
            }
        });
    }

    private void insertrecords(){
        List<String> y = new ArrayList<String>();
        for(int i=1960;i<=2094;i++) y.add(Integer.toString(i));
        ArrayAdapter<String> dataAdapter = new
ArrayAdapter<String>(this, android.R.layout.simple_spinner_item, y);

dataAdapter.setDropDownViewResource(android.R.layout.simple_spinner_
dropdown_item);
        sy.setAdapter(dataAdapter);

        List<String> m=new ArrayList<String>();
        for(int i=1;i<=12;i++) m.add(Integer.toString(i));
        ArrayAdapter<String> dataAdapter2 = new
ArrayAdapter<String>(this, android.R.layout.simple_spinner_item, m);

dataAdapter2.setDropDownViewResource(android.R.layout.simple_spinner
_dropdown_item);
        sm.setAdapter(dataAdapter2);

        insertrecords2();
    }

    private void insertrecords2(){
        int max=0;

if(sm.getSelectedItem().equals("1")||sm.getSelectedItem().equals("3"
)||sm.getSelectedItem().equals("5")||

sm.getSelectedItem().equals("7")||sm.getSelectedItem().equals("8")||

sm.getSelectedItem().equals("10")||sm.getSelectedItem().equals("12")
) max=31;
        else
if(sm.getSelectedItem().equals("4")||sm.getSelectedItem().equals("6"
)||

sm.getSelectedItem().equals("9")||sm.getSelectedItem().equals("11"))
max=30;
        else {

if((Integer.parseInt(sy.getSelectedItem().toString())%4==0 &&

Integer.parseInt(sy.getSelectedItem().toString())!=0)||

Integer.parseInt(sy.getSelectedItem().toString())%400==0) max=29;
```

```
            else max=28;
        }
        List<String> d=new ArrayList<String>();
        for(int i=1;i<=max;i++) d.add(Integer.toString(i));
        ArrayAdapter<String> dataAdapter3 = new
ArrayAdapter<String>(this, android.R.layout.simple_spinner_item, d);

dataAdapter3.setDropDownViewResource(android.R.layout.simple_spinner
_dropdown_item);
        sd.setAdapter(dataAdapter3);
    }

    private void currentDate(){
        Calendar now=Calendar.getInstance();
        sy.setSelection(now.get(Calendar.YEAR)-1960);
        sm.setSelection(now.get(Calendar.MONTH));
        sd.setSelection(now.get(Calendar.DAY_OF_MONTH));
    }
}
```

Listing 2: The source code for AddOneWeek.java file [own study]

```
package com.example.hba1c;

import android.content.ContentValues;
import android.content.Context;
import android.database.sqlite.SQLiteDatabase;
import android.database.sqlite.SQLiteDatabase.CursorFactory;
import android.database.sqlite.SQLiteOpenHelper;
import android.database.Cursor;

import java.util.LinkedList;
import java.util.List;

public class DatabaseManager extends SQLiteOpenHelper {
    public DatabaseManager(Context context){
        super(context,"testes.db",null,1);
    }
    public void onCreate(SQLiteDatabase db){
        db.execSQL(
                "create table tests(" +
                        "nr integer primary key autoincrement," +
                        "date text," +
                        "time text,"+
                        "mgdL text," +
                        "mmolL text);"
        );
```

```
        for(int i=0;i<540;i++) {
            if(i%6==0) db.execSQL("insert into tests
(date,time,mgdL,mmolL) " +
                    "values('0000-00-00','1','0','0');");
            else if(i%6==1) db.execSQL("insert into tests
(date,time,mgdL,mmolL) " +
                    "values('0000-00-00','2','0','0');");
            else if(i%6==2) db.execSQL("insert into tests
(date,time,mgdL,mmolL) " +
                    "values('0000-00-00','3','0','0');");
            else if(i%6==3) db.execSQL("insert into tests
(date,time,mgdL,mmolL) " +
                    "values('0000-00-00','4','0','0');");
            else if(i%6==4) db.execSQL("insert into tests
(date,time,mgdL,mmolL) " +
                    "values('0000-00-00','5','0','0');");
            else if(i%6==5) db.execSQL("insert into tests
(date,time,mgdL,mmolL) " +
                    "values('0000-00-00','6','0','0');");
        }
    }
    public void onUpgrade(SQLiteDatabase db,int oldVersion,int
newVersion){
        db.execSQL("DROP TABLE IF EXISTS tests");
        onCreate(db);
    }

    //INCOMES
    public void addTest(String date,String time,String mgdL,String
mmolL){
        SQLiteDatabase db=getWritableDatabase();
        ContentValues values=new ContentValues();
        values.put("date",date);
        values.put("time",time);
        values.put("mgdL",mgdL);
        values.put("mmolL",mmolL);
        db.insertOrThrow("tests",null,values);
    }

    public void deleteTest(int id){
        SQLiteDatabase db=getWritableDatabase();
        String[]arguments={""+id};
        db.delete("tests","nr=?",arguments);
    }

    public void updateTest(int nr,String date,/*String time,*/String
mgdL,String mmolL){
        SQLiteDatabase db=getWritableDatabase();
        ContentValues values=new ContentValues();
```

```
        values.put("date",date);
        //values.put("time",time);
        values.put("mgdL",mgdL);
        values.put("mmolL",mmolL);
        String args[]={nr+""};
        db.update("tests",values,"nr=?",args);
    }

    public Cursor giveAllTheTests(){
        String[]columns={"nr","date","time","mgdL","mmolL"};
        SQLiteDatabase db=getReadableDatabase();
        Cursor
cursor=db.query("tests",columns,null,null,null,null,null);
        return cursor;
    }

    public Test giveTest(int nr){
        Test test =new Test();
        SQLiteDatabase db=getReadableDatabase();
        String[]columns={"nr","date","time","mgdL","mmolL"};
        String args[]={nr+""};
        Cursor
cursor=db.query("tests",columns,"nr=?",args,null,null,null,null);
        if(cursor!=null){
            cursor.moveToFirst();
            test.setNr(cursor.getLong(0));
            test.setDate2(cursor.getString(1));
            test.setTime2(cursor.getString(2));
            test.setMgdL(cursor.getString(3));
            test.setMmolL(cursor.getString(4));
        }
        return test;
    }
    //End Tests
}
```

Listing 3: The source code for DatabaseManager.java file [own study]

```
package com.example.hba1c;

import android.database.Cursor;
import android.graphics.Color;
import android.os.Bundle;

import androidx.appcompat.app.AppCompatActivity;

import com.github.mikephil.charting.charts.LineChart;
```

```
import com.github.mikephil.charting.data.Entry;
import com.github.mikephil.charting.data.LineData;
import com.github.mikephil.charting.data.LineDataSet;
import com.github.mikephil.charting.utils.ColorTemplate;

import java.util.ArrayList;

//other pages
//https://www.codingdemos.com/draw-android-line-chart/
//https://learningprogramming.net/mobile/android/line-chart-in-
android/
//this page
//https://www.tutorialspoint.com/how-to-use-line-chart-graph-in-
android

public class Graph extends AppCompatActivity {
    LineChart lineChart;
    LineData lineData;
    LineDataSet lineDataSet;
    ArrayList lineEntries;
    DatabaseManager dm;
    Cursor k;
    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_graph);

        lineChart = findViewById(R.id.lineChart);
        lineEntries = new ArrayList<>();
        dm=new DatabaseManager(getApplicationContext());
        k=dm.giveAllTheTests();
        int i=0;
        while(k.moveToNext()){
            lineEntries.add(new
Entry((float)i,(float)Integer.parseInt(k.getString(3))));
            i++;
        }
        lineDataSet = new LineDataSet(lineEntries, "");
        lineData = new LineData(lineDataSet);
        lineChart.setData(lineData);
        lineDataSet.setColors(ColorTemplate.JOYFUL_COLORS);
        lineDataSet.setValueTextColor(Color.BLACK);
        lineDataSet.setLabel("");

        lineDataSet.setValueTextSize(18f);
    }
}
```

Listing 4: The source code for Graph.java file [own study]

```
package com.example.hba1c;

import android.content.Intent;
import android.os.Bundle;
import android.view.View;
import android.widget.ImageButton;

import androidx.appcompat.app.AppCompatActivity;

public class MainActivity extends AppCompatActivity {
    private ImageButton
imgbtnshow,imgbtngraph,imgbtnsearch,imgbtnadd1,imgbtnadd7,imgbtnupda
te,imgbtnexit;
    DatabaseManager dm;
    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);

        initializecomponents();
    }
    private void initializecomponents(){
        dm=new DatabaseManager(getApplicationContext());

        imgbtnshow=findViewById(R.id.imgbtnshow);
        imgbtnshow.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
                Intent intent=new
Intent(getApplicationContext(),ShowingActivity.class);
                startActivity(intent);
            }
        });
        imgbtngraph=findViewById(R.id.imgbtngraph);
        imgbtngraph.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
                Intent intent=new
Intent(getApplicationContext(),Graph.class);
                startActivity(intent);
            }
        });
        imgbtnsearch=findViewById(R.id.imgbtnsearching);
        imgbtnsearch.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
```

```
                Intent intent=new
Intent(getApplicationContext(),Searching.class);
                startActivity(intent);
            }
        });
        imgbtnadd1=findViewById(R.id.imgbtnadd1);
        imgbtnadd1.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
                Intent intent=new
Intent(getApplicationContext(),AddOneDay.class);
                startActivity(intent);
            }
        });
        imgbtnadd7=findViewById(R.id.imgbtnadd7);
        imgbtnadd7.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
                Intent intent=new
Intent(getApplicationContext(),AddOneWeek.class);
                startActivity(intent);
            }
        });
        imgbtnupdate=findViewById(R.id.imgbtnupdate);
        imgbtnupdate.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
                Intent intent=new
Intent(getApplicationContext(),UpdateOneTest.class);
                startActivity(intent);
            }
        });
        imgbtnexit=findViewById(R.id.imgbtnexit);
        imgbtnexit.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
                finish();
            }
        });
    }
}
```

Listing 4: The source code for MainActivity.java file [own study]

```
package com.example.hba1c;

import android.os.Bundle;
import android.view.View;
```

```
import android.widget.EditText;
import android.widget.ImageButton;
import android.widget.TextView;
import android.widget.RadioButton;
import android.database.Cursor;

import androidx.appcompat.app.AppCompatActivity;

public class Searching extends AppCompatActivity {
    private EditText etmin,etmax;
    private RadioButton rb1,rb2;
    private ImageButton imgbtnsearching,imgbtnfinish;
    private TextView tv;
    DatabaseManager dm;
    Cursor k;

    private int[]address=new int[540];
    private int min,max,quantity;
    private CharSequence buffer;
    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_searching);
        initializecomponents();
    }

    private void initializecomponents(){
        dm=new DatabaseManager(getApplicationContext());
        k=dm.giveAllTheTests();
        tv=findViewById(R.id.tvsearching);
        quantity=0;
        while(k.moveToNext()) {
            address[quantity] = Integer.parseInt(k.getString(3));
quantity++;
        }
        rb1=findViewById(R.id.rB1);
        rb1.setChecked(true);
        rb2=findViewById(R.id.rB2);
        rb2.setChecked(false);
        etmin=findViewById(R.id.etmin);
        etmin.setHint("Enter the value");
        etmax=findViewById(R.id.etmax);
        etmax.setVisibility(View.GONE);
        imgbtnsearching=findViewById(R.id.imgbtnsearching);
        imgbtnsearching.setOnClickListener(new
View.OnClickListener() {
            @Override
            public void onClick(View v) {
                searching();
```

```
            }
        });
        imgbtnfinish=findViewById(R.id.imgbtnfinish);
        imgbtnfinish.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
                finish();
            }
        });
    }

    public void searching(){
        buffer=""; quantity=0;
        if(rb1.isChecked()){
            if(etmin.getText().toString().equals(""))
etmin.setText("0");
            min=Integer.parseInt(etmin.getText().toString());
            for(int i=0;i<address.length;i++){
                if(min==address[i]) {
                    quantity++;
                    buffer=buffer +""+quantity+".";
                    if(quantity<10) buffer=buffer+"\t\t";
                    else if(quantity<100) buffer=buffer+"\t";
                    buffer=buffer+"\t"+min+"\t\t\t["+ (i + 1) +
"]\r\n";
                }
            }
        }else if(rb2.isChecked()){
            if(etmin.getText().toString().equals(""))
etmin.setText("0");
            if(etmax.getText().toString().equals(""))
etmax.setText("0");
            min=Integer.parseInt(etmin.getText().toString());
            max=Integer.parseInt(etmax.getText().toString());
            if(min>max){
                int tmp=min;
                min=max;
                max=tmp;
            }
            for(int i=0;i<address.length;i++){
                if(address[i]>=min && address[i]<=max) {
                    quantity++;
                    buffer=buffer + "" + quantity + ".";
                    if(quantity<10) buffer=buffer+"\t\t";
                    else if(quantity<100) buffer=buffer+"\t";
                    buffer=buffer+"\t"+ address[i] + "\t\t\t[" + (i
+ 1) + "]\r\n";
                }
            }
```

```
        }
        etmin.setText("");
        etmax.setText("");
        tv.setText(buffer);
    }

    public void onRadioButtonClicked(View view) {
        // Is the button now checked?
        boolean checked = ((RadioButton) view).isChecked();

        // Check which radio button was clicked
        switch(view.getId()) {
            case R.id.rB1: {
                if (checked) {
                    etmin.setHint("Enter the value");
                    etmin.setText("");
                    etmin.setVisibility(View.VISIBLE);
                    etmax.setHint("");
                    etmax.setText("");
                    etmax.setVisibility(View.GONE);
                }
                break;
            }
            case R.id.rB2: {
                if (checked) {
                    etmin.setHint("Enter the minimum");
                    etmin.setText("");
                    etmax.setHint("Enter the maximum");
                    etmax.setText("");
                    etmin.setVisibility(View.VISIBLE);
                    etmax.setVisibility(View.VISIBLE);
                }
                break;
            }
        }
    }

}
```

Listing 5: The source code for Searching.java file [own study]

```
package com.example.hba1c;

import android.database.Cursor;
import android.os.Bundle;
import android.widget.TextView;

import androidx.appcompat.app.AppCompatActivity;
```

```
import androidx.appcompat.widget.Toolbar;

public class ShowingActivity extends AppCompatActivity {
    private TextView tv;
    DatabaseManager dm;
    Cursor k;
    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_showing);
        Toolbar toolbar = findViewById(R.id.toolbar);
        setSupportActionBar(toolbar);

        showTests();
    }

    private void showTests(){
        int number=0;
        int imin=0,imax=0;
        int min=0,max=0;
        double[]counter={0,0,0,0,0,0,0};
        int[]quartiles=new int[540];
        double totalmgdl=0,totalmmoll=0;
        double[][]totals=new double[6][2];
        for(int i=0;i<6;i++) for(int j=0;j<2;j++) totals[i][j]=0;
        double HbA1c1,HbA1c2,HbA1c3;
        dm=new DatabaseManager(getApplicationContext());
        tv=findViewById(R.id.tv);
        k=dm.giveAllTheTests();
        CharSequence buffer="";
        while (k.moveToNext()){

if(!(k.getString(3).equals("0"))&&!(k.getString(4).equals("0"))) {
                number++;
                totalmgdl+=Double.parseDouble(k.getString(3));
                totalmmoll+=Double.parseDouble(k.getString(4));

                if(number==1){
                    min=Integer.parseInt(k.getString(3));
imin=number;
                    max=Integer.parseInt(k.getString(3));
imax=number;
                }else{
                    if(min>Integer.parseInt(k.getString(3))){
                        min=Integer.parseInt(k.getString(3));
imin=number;
                    }
                    if(max<Integer.parseInt(k.getString(3))){
```

```
                        max=Integer.parseInt(k.getString(3));
imax=number;
                    }
                }

                if(Integer.parseInt(k.getString(3))<70)
counter[0]++;
                else if(Integer.parseInt(k.getString(3))>=70&&
                        Integer.parseInt(k.getString(3))<=135)
counter[1]++;
                else if(Integer.parseInt(k.getString(3))>=136&&
                        Integer.parseInt(k.getString(3))<=180)
counter[2]++;
                else if(Integer.parseInt(k.getString(3))>=181&&
                        Integer.parseInt(k.getString(3))<=240)
counter[3]++;
                else if(Integer.parseInt(k.getString(3))>=241&&
                        Integer.parseInt(k.getString(3))<=299)
counter[4]++;
                else if(Integer.parseInt(k.getString(3))>=300)
counter[5]++;

                if(Integer.parseInt(k.getString(3))<=160)
counter[6]++;

                if(Integer.parseInt(k.getString(2))==1)
totals[0][0]+=Integer.parseInt(k.getString(3));
                else if(Integer.parseInt(k.getString(2))==2)
totals[1][0]+=Integer.parseInt(k.getString(3));
                else if(Integer.parseInt(k.getString(2))==3)
totals[2][0]+=Integer.parseInt(k.getString(3));
                else if(Integer.parseInt(k.getString(2))==4)
totals[3][0]+=Integer.parseInt(k.getString(3));
                else if(Integer.parseInt(k.getString(2))==5)
totals[4][0]+=Integer.parseInt(k.getString(3));
                else if(Integer.parseInt(k.getString(2))==6)
totals[5][0]+=Integer.parseInt(k.getString(3));

                if(number>=499){
                    if(Integer.parseInt(k.getString(2))==1)
totals[0][1]+=Integer.parseInt(k.getString(3));
                    else if(Integer.parseInt(k.getString(2))==2)
totals[1][1]+=Integer.parseInt(k.getString(3));
                    else if(Integer.parseInt(k.getString(2))==3)
totals[2][1]+=Integer.parseInt(k.getString(3));
                    else if(Integer.parseInt(k.getString(2))==4)
totals[3][1]+=Integer.parseInt(k.getString(3));
                    else if(Integer.parseInt(k.getString(2))==5)
totals[4][1]+=Integer.parseInt(k.getString(3));
```

```
                    else if(Integer.parseInt(k.getString(2))==6)
totals[5][1]+=Integer.parseInt(k.getString(3));
                }
            }
            int nr=k.getInt(0);
            String date=k.getString(1);
            String time=k.getString(2);
            String mgdL=k.getString(3); quartiles[number-
1]=Integer.parseInt(mgdL);
            String mmolL=k.getString(4);

            if(nr<10) buffer=buffer+""+nr+".\t\t";
            else if(nr<100) buffer=buffer+""+nr+".\t";
            else buffer=buffer+""+nr+".";
            if(Double.parseDouble(mgdL)>99)
buffer=buffer+"\t"+date+"\t\t"+time+"\t\t"+mgdL+"\t\t("+mmolL+")\r\n
";
            else if(Double.parseDouble(mgdL)>9)
buffer=buffer+"\t"+date+"\t\t"+time+"\t\t"+mgdL+"\t\t("+mmolL+")\r\n
";
            else
buffer=buffer+"\t\t"+date+"\t\t"+time+"\t\t"+mgdL+"\t\t("+mmolL+")\r
\n";

        }

        if(number==0) HbA1c1=0;
        else if(totalmgdl/number<=76) HbA1c1=5;
        else if(totalmgdl/number<=88) HbA1c1=5.5;
        else if(totalmgdl/number<=100) HbA1c1=6;
        else if(totalmgdl/number<=111.5) HbA1c1=6.5;
        else if(totalmgdl/number<=123) HbA1c1=7;
        else if(totalmgdl/number<=135) HbA1c1=7.5;
        else if(totalmgdl/number<=147) HbA1c1=8;
        else if(totalmgdl/number<=158.5) HbA1c1=8.5;
        else if(totalmgdl/number<=170) HbA1c1=9;
        else if(totalmgdl/number<=181.5) HbA1c1=9.5;
        else if(totalmgdl/number<=193) HbA1c1=10;
        else if(totalmgdl/number<=205) HbA1c1=10.5;
        else if(totalmgdl/number<=217) HbA1c1=11;
        else if(totalmgdl/number<=228.5) HbA1c1=11.5;
        else if(totalmgdl/number<=240) HbA1c1=12;
        else HbA1c1=12.5;

        if(number==0) HbA1c2=0;
        else if(totalmgdl/number<=97) HbA1c2=5;
        else if(totalmgdl/number<=111.5) HbA1c2=5.5;
        else if(totalmgdl/number<=126) HbA1c2=6;
        else if(totalmgdl/number<=140) HbA1c2=6.5;
```

```
else if(totalmgdl/number<=154) HbA1c2=7;
else if(totalmgdl/number<=168.5) HbA1c2=7.5;
else if(totalmgdl/number<=183) HbA1c2=8;
else if(totalmgdl/number<=197.5) HbA1c2=8.5;
else if(totalmgdl/number<=212) HbA1c2=9;
else if(totalmgdl/number<=226) HbA1c2=9.5;
else if(totalmgdl/number<=240) HbA1c2=10;
else if(totalmgdl/number<=254.4) HbA1c2=10.5;
else if(totalmgdl/number<=269) HbA1c2=11;
else if(totalmgdl/number<=283.5) HbA1c2=11.5;
else if(totalmgdl/number<=298) HbA1c2=12;
else HbA1c2=12.5;

if(number==0) HbA1c3=0;
else if(totalmgdl/number<=120) HbA1c3=5;
else if(totalmgdl/number<=136) HbA1c3=5.5;
else if(totalmgdl/number<=152) HbA1c3=6;
else if(totalmgdl/number<=168.5) HbA1c3=6.5;
else if(totalmgdl/number<=185) HbA1c3=7;
else if(totalmgdl/number<=201) HbA1c3=7.5;
else if(totalmgdl/number<=217) HbA1c3=8;
else if(totalmgdl/number<=233) HbA1c3=8.5;
else if(totalmgdl/number<=249) HbA1c3=9;
else if(totalmgdl/number<=265.5) HbA1c3=9.5;
else if(totalmgdl/number<=282) HbA1c3=10;
else if(totalmgdl/number<=298) HbA1c3=10.5;
else if(totalmgdl/number<=314) HbA1c3=11;
else if(totalmgdl/number<=330.5) HbA1c3=11.5;
else if(totalmgdl/number<=347) HbA1c3=12;
else HbA1c3=12.5;

//quartiles
int temp;
int change = 1;
while(change > 0){
    change = 0;
    for(int i=0; i<quartiles.length-1; i++){
        if(quartiles[i]>quartiles[i+1]){
            temp = quartiles[i+1];
            quartiles[i+1] = quartiles[i];
            quartiles[i] = temp;
            change++;
        }
    }
}
//end

buffer= "STATISTICS"+
```

```
                "\r\n\r\nHbA1c
(Hard):\t\t\t\t\t\t\t\t\t\t\t"+String.format("%.1f",HbA1c1)+
                "\r\nHbA1c
(Medium):\t\t\t\t\t\t\t\t\t"+String.format("%.1f",HbA1c2)+
                "\r\nHbA1c
(Easy):\t\t\t\t\t\t\t\t\t\t\t"+String.format("%.1f",HbA1c3)+

                "\r\n\r\nHbA1c
(Real):\t\t\t\t\t\t\t\t\t\t\t"+String.format("%.1f",(HbA1c2+(HbA1c1-
HbA1c2)/2))+

                "\r\n\r\nNeutral
(x<=135)\t\t\t\t\t\t\t\t\t\t"+(int)(counter[0]+counter[1])+"/"+(int)
((counter[0]+counter[1])/540*100)+"%"+
                "\r\nLowered
(x<70)\t\t\t\t\t\t\t\t\t\t"+(int)counter[0]+"/"+(int)(counter[0]/540
*100)+"%"+
                "\r\nCorrect
(70<=x<=135)\t\t\t\t\t\t\t"+(int)counter[1]+"/"+(int)(counter[1]/540
*100)+"%"+
                "\r\nElevated
(136<=x<=180)\t\t\t\t\t\t"+(int)counter[2]+"/"+(int)(counter[2]/540*
100)+"%"+
                "\r\nGood
(x<=160)\t\t\t\t\t\t\t\t\t\t"+(int)counter[6]+"/"+(int)(counter[6]
/540*100)+"%"+
                "\r\n\r\nCritical
(x>180)\t\t\t\t\t\t\t\t\t\t"+(int)(counter[3]+counter[4]+counter[5])
+"/"+(int)((counter[3]+counter[4]+counter[5])/540*100)+"%"+
                "\r\nCritical 1st degree
(181<=x<=240)\t\t"+(int)counter[3]+"/"+(int)(counter[3]/540*100)+"%"
+
                "\r\nCritical 2nd degree
(241<=x<=299)\t"+(int)counter[4]+"/"+(int)(counter[4]/540*100)+"%"+
                "\r\nCritical 3rd degree
(x>=300)\t\t\t\t\t"+(int)counter[5]+"/"+(int)(counter[5]/540*100)+"%
"+

                "\r\n\r\nCritical 1st degree of
degree\t\t\t\t"+(int)(counter[3]/(counter[3]+counter[4]+counter[5])*
100)+"%"+
                "\r\nCritical 2nd degree of
degree\t\t\t\t"+(int)(counter[4]/(counter[3]+counter[4]+counter[5])*
100)+"%"+
                "\r\nCritical 3rd degree of
degree\t\t\t\t"+(int)(counter[5]/(counter[3]+counter[4]+counter[5])*
100)+"%"+
```

```
                "\r\n\r\nAverage
[mg/dL]:\t\t\t\t\t\t\t\t\t"+String.format("%.1f",(totalmgdl/number))
+
                "\r\nTotal
[mg/dL]:\t\t\t\t\t\t\t\t\t\t"+(int)totalmgdl+

                "\r\n\r\nMinimum and maximum range:\t\t\t"+(max-
min)+

                "\r\n\r\nQuartile 0
(minimum):\t\t\t\t\t\t\t"+quartiles[0]+" ["+imin+"]"+
                "\r\nQuartile
I:\t\t\t\t\t\t\t\t\t\t\t\t"+(quartiles[134]+quartiles[135])/2+
                "\r\nQuartile II
(Median):\t\t\t\t\t\t\t"+(quartiles[269]+quartiles[270])/2+
                "\r\nQuartile
III:\t\t\t\t\t\t\t\t\t\t\t"+(quartiles[404]+quartiles[405])/2+
                "\r\nQuartile IV
(maximum):\t\t\t\t\t\t\t"+quartiles[quartiles.length-1]+"
["+imax+"]"+

                "\r\n\r\nDATA FOR ALL TESTS\r\n"+
                "\r\nAverage for 1:\t\t\t\t\t\t\t\t\t\t
"+String.format(" % .1f ",totals[0][0]/90)+
                "\r\nAverage for 2:\t\t\t\t\t\t\t\t\t\t
"+String.format(" % .1f ",totals[1][0]/90)+
                "\r\nAverage for 3:\t\t\t\t\t\t\t\t\t\t
"+String.format(" % .1f ",totals[2][0]/90)+
                "\r\nAverage for 4:\t\t\t\t\t\t\t\t\t\t
"+String.format(" % .1f ",totals[3][0]/90)+
                "\r\nAverage for 5:\t\t\t\t\t\t\t\t\t\t
"+String.format(" % .1f ",totals[4][0]/90)+
                "\r\nAverage for 6:\t\t\t\t\t\t\t\t\t\t
"+String.format(" % .1f ",totals[5][0]/90)+

                "\r\n\r\nTotal for
1:\t\t\t\t\t\t\t\t\t\t\t\t"+(int)totals[0][0]+
                "\r\nTotal for
2:\t\t\t\t\t\t\t\t\t\t\t\t"+(int)totals[1][0]+
                "\r\nTotal for
3:\t\t\t\t\t\t\t\t\t\t\t\t"+(int)totals[2][0]+
                "\r\nTotal for
4:\t\t\t\t\t\t\t\t\t\t\t\t"+(int)totals[3][0]+
                "\r\nTotal for
5:\t\t\t\t\t\t\t\t\t\t\t\t"+(int)totals[4][0]+
                "\r\nTotal for
6:\t\t\t\t\t\t\t\t\t\t\t\t"+(int)totals[5][0]+

                "\r\n\r\nDATA FOR THE LAST WEEK\r\n"+
```

```
                "\r\nAverage for 1:\t\t\t\t\t\t\t\t\t\t\t
"+String.format(" % .1f ",totals[0][1]/7)+
                "\r\nAverage for 2:\t\t\t\t\t\t\t\t\t\t\t
"+String.format(" % .1f ",totals[1][1]/7)+
                "\r\nAverage for 3:\t\t\t\t\t\t\t\t\t\t\t
"+String.format(" % .1f ",totals[2][1]/7)+
                "\r\nAverage for 4:\t\t\t\t\t\t\t\t\t\t\t
"+String.format(" % .1f ",totals[3][1]/7)+
                "\r\nAverage for 5:\t\t\t\t\t\t\t\t\t\t\t
"+String.format(" % .1f ",totals[4][1]/7)+
                "\r\nAverage for 6:\t\t\t\t\t\t\t\t\t\t\t
"+String.format(" % .1f ",totals[5][1]/7)+

                "\r\n\r\nTotal for
1:\t\t\t\t\t\t\t\t\t\t\t\t\t\t"+(int)totals[0][1]+
                "\r\nTotal for
2:\t\t\t\t\t\t\t\t\t\t\t\t\t\t"+(int)totals[1][1]+
                "\r\nTotal for
3:\t\t\t\t\t\t\t\t\t\t\t\t\t\t"+(int)totals[2][1]+
                "\r\nTotal for
4:\t\t\t\t\t\t\t\t\t\t\t\t\t\t"+(int)totals[3][1]+
                "\r\nTotal for
5:\t\t\t\t\t\t\t\t\t\t\t\t\t\t"+(int)totals[4][1]+
                "\r\nTotal for
6:\t\t\t\t\t\t\t\t\t\t\t\t\t\t"+(int)totals[5][1]+

                "\r\n\r\nAverage
[mmol/L]:\t\t\t\t\t\t\t\t\t\t"+String.format("%.1f",(totalmmoll/number
))+
                "\r\nTotal
[mmol/L]:\t\t\t\t\t\t\t\t\t\t"+String.format("%.1f",totalmmoll)+


"\r\n\r\nQuantity:\t\t\t\t\t\t\t\t\t\t\t\t"+number+"\r\n\r\n\r\n"+
buffer;

                tv.setText(buffer);
    }
}
```

Listing 6: The source code for ShowingActivity.java file [own study]

```
package com.example.hba1c;

public class Test {
    private Long nr;
    private String date;
    private String mgdL;
```

```
    private String mmolL;
    private String time;

    public Long getNr(){ return nr;}
    public void setNr(Long nr){this.nr=nr;}

    public String getDate2(){ return date;}
    public void setDate2(String date){this.date=date;}

    public String getMgdL(){ return mgdL;}
    public void setMgdL(String mgdL){this.mgdL=mgdL;}

    public String getMmolL(){ return mmolL;}
    public void setMmolL(String mmolL){this.mmolL=mmolL;}

    public String getTime2(){ return time;}
    public void setTime2(String time){this.time=time;}
}
```

Listing 7: The source code for Test.java file [own study]

```
package com.example.hba1c;

import android.database.Cursor;
import android.os.Bundle;
import android.view.View;
import android.widget.AdapterView;
import android.widget.ArrayAdapter;
import android.widget.EditText;
import android.widget.ImageButton;
import android.widget.Spinner;
import android.widget.TextView;
import android.widget.Toast;

import androidx.appcompat.app.AppCompatActivity;

import java.util.ArrayList;
import java.util.Calendar;
import java.util.List;

public class UpdateOneTest extends AppCompatActivity {
    private Spinner sy,sm,sd;
    private EditText etid,ett;
    private ImageButton imgbtnupdate,imgbtnback;
    private TextView tv;
    DatabaseManager dm;
    Cursor k;
    @Override
```

```
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_update_one_test);

        initializecomponents();
        showTests();
        insertrecords();
        currentDate();
    }

    private void initializecomponents(){
        dm=new DatabaseManager(getApplicationContext());
        k=dm.giveAllTheTests();
        tv=findViewById(R.id.tv);
        sy=findViewById(R.id.syear);
        sy.setOnItemSelectedListener(new
AdapterView.OnItemSelectedListener()
        {
            public void onItemSelected(AdapterView<?> parent, View
view, int position, long id)
            {
                /*String selectedItem =
parent.getItemAtPosition(position).toString();
                if(selectedItem.equals("2"))
                {
                    // do your stuff
                }*/
                insertrecords2();
            } // to close the onItemSelected
            public void onNothingSelected(AdapterView<?> parent)
            {

            }
        });
        sm=findViewById(R.id.smonth);
        sm.setOnItemSelectedListener(new
AdapterView.OnItemSelectedListener()
        {
            public void onItemSelected(AdapterView<?> parent, View
view, int position, long id)
            {
                /*String selectedItem =
parent.getItemAtPosition(position).toString();
                if(selectedItem.equals("2"))
                {
                    // do your stuff
                }*/
                insertrecords2();
            } // to close the onItemSelected
```

```
            public void onNothingSelected(AdapterView<?> parent)
            {

            }
        });
        sd=findViewById(R.id.sday);
        etid=findViewById(R.id.etid);
        ett=findViewById(R.id.ett);
        imgbtnupdate=findViewById(R.id.imgbtnupdate);
        imgbtnupdate.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
                if(etid.getText().toString().length()>0 &&
ett.getText().toString().length()>0) {
                    String date = sy.getSelectedItem().toString() +
"-";
                    if (sm.getSelectedItem().toString().length() <
2)
                        date = date + "0" +
sm.getSelectedItem().toString() + "-";
                    else date = date +
sm.getSelectedItem().toString() + "-";
                    if (sd.getSelectedItem().toString().length() <
2)
                        date = date + "0" +
sd.getSelectedItem().toString();
                    else date = date +
sd.getSelectedItem().toString();

dm.updateTest(Integer.parseInt(etid.getText().toString()),date,ett.g
etText().toString(),
                            String.format("%.1f",
Double.parseDouble(ett.getText().toString()) * 0.0555));
                    finish();
                }else Toast.makeText(getApplicationContext(),"Enter
all data",Toast.LENGTH_LONG).show();
            }
        });
        imgbtnback=findViewById(R.id.imgbtnback);
        imgbtnback.setOnClickListener(new View.OnClickListener() {
            @Override
            public void onClick(View v) {
                finish();
            }
        });
    }


    private void showTests(){
```

```
        int number=0;
        int imin=0,imax=0;
        int min=0,max=0;
        double[]counter={0,0,0,0,0,0,0};
        int[]quartiles=new int[540];
        double totalmgdl=0,totalmmoll=0;
        double[][]totals=new double[6][2];
        for(int i=0;i<6;i++) for(int j=0;j<2;j++) totals[i][j]=0;
        double HbA1c1,HbA1c2,HbA1c3;
        dm=new DatabaseManager(getApplicationContext());
        tv=findViewById(R.id.tv);
        k=dm.giveAllTheTests();
        CharSequence buffer="";
        while (k.moveToNext()){

if(!(k.getString(3).equals("0"))&&!(k.getString(4).equals("0"))) {
                number++;
                totalmgdl+=Double.parseDouble(k.getString(3));
                totalmmoll+=Double.parseDouble(k.getString(4));

                if(number==1){
                    min=Integer.parseInt(k.getString(3));
imin=number;
                    max=Integer.parseInt(k.getString(3));
imax=number;
                }else{
                    if(min>Integer.parseInt(k.getString(3))){
                        min=Integer.parseInt(k.getString(3));
imin=number;
                    }
                    if(max<Integer.parseInt(k.getString(3))){
                        max=Integer.parseInt(k.getString(3));
imax=number;
                    }
                }

                if(Integer.parseInt(k.getString(3))<70)
counter[0]++;
                else if(Integer.parseInt(k.getString(3))>=70&&
                        Integer.parseInt(k.getString(3))<=135)
counter[1]++;
                else if(Integer.parseInt(k.getString(3))>=136&&
                        Integer.parseInt(k.getString(3))<=180)
counter[2]++;
                else if(Integer.parseInt(k.getString(3))>=181&&
                        Integer.parseInt(k.getString(3))<=240)
counter[3]++;
                else if(Integer.parseInt(k.getString(3))>=241&&
```

```
                        Integer.parseInt(k.getString(3))<=299)
counter[4]++;
                else if(Integer.parseInt(k.getString(3))>=300)
counter[5]++;

                if(Integer.parseInt(k.getString(3))<=160)
counter[6]++;

                if(Integer.parseInt(k.getString(2))==1)
totals[0][0]+=Integer.parseInt(k.getString(3));
                else if(Integer.parseInt(k.getString(2))==2)
totals[1][0]+=Integer.parseInt(k.getString(3));
                else if(Integer.parseInt(k.getString(2))==3)
totals[2][0]+=Integer.parseInt(k.getString(3));
                else if(Integer.parseInt(k.getString(2))==4)
totals[3][0]+=Integer.parseInt(k.getString(3));
                else if(Integer.parseInt(k.getString(2))==5)
totals[4][0]+=Integer.parseInt(k.getString(3));
                else if(Integer.parseInt(k.getString(2))==6)
totals[5][0]+=Integer.parseInt(k.getString(3));

                if(number>=499){
                    if(Integer.parseInt(k.getString(2))==1)
totals[0][1]+=Integer.parseInt(k.getString(3));
                    else if(Integer.parseInt(k.getString(2))==2)
totals[1][1]+=Integer.parseInt(k.getString(3));
                    else if(Integer.parseInt(k.getString(2))==3)
totals[2][1]+=Integer.parseInt(k.getString(3));
                    else if(Integer.parseInt(k.getString(2))==4)
totals[3][1]+=Integer.parseInt(k.getString(3));
                    else if(Integer.parseInt(k.getString(2))==5)
totals[4][1]+=Integer.parseInt(k.getString(3));
                    else if(Integer.parseInt(k.getString(2))==6)
totals[5][1]+=Integer.parseInt(k.getString(3));
                    }
            }
            int nr=k.getInt(0);
            String date=k.getString(1);
            String time=k.getString(2);
            String mgdL=k.getString(3); quartiles[number-
1]=Integer.parseInt(mgdL);
            String mmolL=k.getString(4);

            if(nr<10) buffer=buffer+""+nr+".\t\t";
            else if(nr<100) buffer=buffer+""+nr+".\t";
            else buffer=buffer+""+nr+".";
            if(Double.parseDouble(mgdL)>99)
buffer=buffer+"\t"+date+"\t\t"+time+"\t\t"+mgdL+"\t\t("+mmolL+")\r\n
";
```

```
            else if(Double.parseDouble(mgdL)>9)
buffer=buffer+"\t"+date+"\t\t"+time+"\t\t"+mgdL+"\t\t("+mmolL+")\r\n
";
            else
buffer=buffer+"\t\t"+date+"\t\t"+time+"\t\t"+mgdL+"\t\t("+mmolL+")\r
\n";

        }

        if(number==0) HbA1c1=0;
        else if(totalmgdl/number<=76) HbA1c1=5;
        else if(totalmgdl/number<=88) HbA1c1=5.5;
        else if(totalmgdl/number<=100) HbA1c1=6;
        else if(totalmgdl/number<=111.5) HbA1c1=6.5;
        else if(totalmgdl/number<=123) HbA1c1=7;
        else if(totalmgdl/number<=135) HbA1c1=7.5;
        else if(totalmgdl/number<=147) HbA1c1=8;
        else if(totalmgdl/number<=158.5) HbA1c1=8.5;
        else if(totalmgdl/number<=170) HbA1c1=9;
        else if(totalmgdl/number<=181.5) HbA1c1=9.5;
        else if(totalmgdl/number<=193) HbA1c1=10;
        else if(totalmgdl/number<=205) HbA1c1=10.5;
        else if(totalmgdl/number<=217) HbA1c1=11;
        else if(totalmgdl/number<=228.5) HbA1c1=11.5;
        else if(totalmgdl/number<=240) HbA1c1=12;
        else HbA1c1=12.5;

        if(number==0) HbA1c2=0;
        else if(totalmgdl/number<=97) HbA1c2=5;
        else if(totalmgdl/number<=111.5) HbA1c2=5.5;
        else if(totalmgdl/number<=126) HbA1c2=6;
        else if(totalmgdl/number<=140) HbA1c2=6.5;
        else if(totalmgdl/number<=154) HbA1c2=7;
        else if(totalmgdl/number<=168.5) HbA1c2=7.5;
        else if(totalmgdl/number<=183) HbA1c2=8;
        else if(totalmgdl/number<=197.5) HbA1c2=8.5;
        else if(totalmgdl/number<=212) HbA1c2=9;
        else if(totalmgdl/number<=226) HbA1c2=9.5;
        else if(totalmgdl/number<=240) HbA1c2=10;
        else if(totalmgdl/number<=254.4) HbA1c2=10.5;
        else if(totalmgdl/number<=269) HbA1c2=11;
        else if(totalmgdl/number<=283.5) HbA1c2=11.5;
        else if(totalmgdl/number<=298) HbA1c2=12;
        else HbA1c2=12.5;

        if(number==0) HbA1c3=0;
        else if(totalmgdl/number<=120) HbA1c3=5;
        else if(totalmgdl/number<=136) HbA1c3=5.5;
        else if(totalmgdl/number<=152) HbA1c3=6;
```

```
        else if(totalmgdl/number<=168.5) HbA1c3=6.5;
        else if(totalmgdl/number<=185) HbA1c3=7;
        else if(totalmgdl/number<=201) HbA1c3=7.5;
        else if(totalmgdl/number<=217) HbA1c3=8;
        else if(totalmgdl/number<=233) HbA1c3=8.5;
        else if(totalmgdl/number<=249) HbA1c3=9;
        else if(totalmgdl/number<=265.5) HbA1c3=9.5;
        else if(totalmgdl/number<=282) HbA1c3=10;
        else if(totalmgdl/number<=298) HbA1c3=10.5;
        else if(totalmgdl/number<=314) HbA1c3=11;
        else if(totalmgdl/number<=330.5) HbA1c3=11.5;
        else if(totalmgdl/number<=347) HbA1c3=12;
        else HbA1c3=12.5;

        //quartiles
        int temp;
        int change = 1;
        while(change > 0){
            change = 0;
            for(int i=0; i<quartiles.length-1; i++){
                if(quartiles[i]>quartiles[i+1]){
                    temp = quartiles[i+1];
                    quartiles[i+1] = quartiles[i];
                    quartiles[i] = temp;
                    change++;
                }
            }
        }
        //end

        buffer= "STATISTICS"+
                "\r\n\r\nHbA1c
(Hard):\t\t\t\t\t\t\t\t\t\t\t"+String.format("%.1f",HbA1c1)+
                "\r\nHbA1c
(Medium):\t\t\t\t\t\t\t\t\t"+String.format("%.1f",HbA1c2)+
                "\r\nHbA1c
(Easy):\t\t\t\t\t\t\t\t\t\t\t"+String.format("%.1f",HbA1c3)+

                "\r\n\r\nHbA1c
(Real):\t\t\t\t\t\t\t\t\t\t\t"+String.format("%.1f",(HbA1c2+(HbA1c1-
HbA1c2)/2))+

                "\r\n\r\nNeutral
(x<=135)\t\t\t\t\t\t\t\t\t\t"+(int)(counter[0]+counter[1])+"/"+(int)
((counter[0]+counter[1])/540*100)+"%"+
                "\r\nLowered
(x<70)\t\t\t\t\t\t\t\t\t\t"+(int)counter[0]+"/"+(int)(counter[0]/540
*100)+"%"+
```

```
                "\r\nCorrect
(70<=x<=135)\t\t\t\t\t\t\t"+(int)counter[1]+"/"+(int)(counter[1]/540
*100)+"%"+
                "\r\nElevated
(136<=x<=180)\t\t\t\t\t\t"+(int)counter[2]+"/"+(int)(counter[2]/540*
100)+"%"+
                "\r\nGood
(x<=160)\t\t\t\t\t\t\t\t\t\t\t"+(int)counter[6]+"/"+(int)(counter[6]
/540*100)+"%"+
                "\r\n\r\nCritical
(x>180)\t\t\t\t\t\t\t\t\t\t"+(int)(counter[3]+counter[4]+counter[5])
+"/"+(int)((counter[3]+counter[4]+counter[5])/540*100)+"%"+
                "\r\nCritical 1st degree
(181<=x<=240)\t\t"+(int)counter[3]+"/"+(int)(counter[3]/540*100)+"%"
+
                "\r\nCritical 2nd degree
(241<=x<=299)\t"+(int)counter[4]+"/"+(int)(counter[4]/540*100)+"%"+
                "\r\nCritical 3rd degree
(x>=300)\t\t\t\t\t"+(int)counter[5]+"/"+(int)(counter[5]/540*100)+"%
"+

                "\r\n\r\nCritical 1st degree of
degree\t\t\t\t"+(int)(counter[3]/(counter[3]+counter[4]+counter[5])*
100)+"%"+
                "\r\nCritical 2nd degree of
degree\t\t\t\t"+(int)(counter[4]/(counter[3]+counter[4]+counter[5])*
100)+"%"+
                "\r\nCritical 3rd degree of
degree\t\t\t\t"+(int)(counter[5]/(counter[3]+counter[4]+counter[5])*
100)+"%"+

                "\r\n\r\nAverage
[mg/dL]:\t\t\t\t\t\t\t\t\t"+String.format("%.1f",(totalmgdl/number))
+
                "\r\nTotal
[mg/dL]:\t\t\t\t\t\t\t\t\t\t\t"+(int)totalmgdl+

                "\r\n\r\nMinimum and maximum range:\t\t\t"+(max-
min)+

                "\r\n\r\nQuartile 0
(minimum):\t\t\t\t\t\t\t"+quartiles[0]+" ["+imin+"]"+
                "\r\nQuartile
I:\t\t\t\t\t\t\t\t\t\t\t\t"+(quartiles[134]+quartiles[135])/2+
                "\r\nQuartile II
(Median):\t\t\t\t\t\t\t\t"+(quartiles[269]+quartiles[270])/2+
                "\r\nQuartile
III:\t\t\t\t\t\t\t\t\t\t\t\t"+(quartiles[404]+quartiles[405])/2+
```

```
                "\r\nQuartile IV
(maximum):\t\t\t\t\t\t\t"+quartiles[quartiles.length-1]+"
["+imax+"]"+

                "\r\n\r\nDATA FOR ALL TESTS\r\n"+
                "\r\nAverage for 1:\t\t\t\t\t\t\t\t\t\t
"+String.format(" % .1f ",totals[0][0]/90)+
                "\r\nAverage for 2:\t\t\t\t\t\t\t\t\t\t
"+String.format(" % .1f ",totals[1][0]/90)+
                "\r\nAverage for 3:\t\t\t\t\t\t\t\t\t\t
"+String.format(" % .1f ",totals[2][0]/90)+
                "\r\nAverage for 4:\t\t\t\t\t\t\t\t\t\t
"+String.format(" % .1f ",totals[3][0]/90)+
                "\r\nAverage for 5:\t\t\t\t\t\t\t\t\t\t
"+String.format(" % .1f ",totals[4][0]/90)+
                "\r\nAverage for 6:\t\t\t\t\t\t\t\t\t\t
"+String.format(" % .1f ",totals[5][0]/90)+

                "\r\n\r\nTotal for
1:\t\t\t\t\t\t\t\t\t\t\t\t\t"+(int)totals[0][0]+
                "\r\nTotal for
2:\t\t\t\t\t\t\t\t\t\t\t\t\t"+(int)totals[1][0]+
                "\r\nTotal for
3:\t\t\t\t\t\t\t\t\t\t\t\t\t"+(int)totals[2][0]+
                "\r\nTotal for
4:\t\t\t\t\t\t\t\t\t\t\t\t\t"+(int)totals[3][0]+
                "\r\nTotal for
5:\t\t\t\t\t\t\t\t\t\t\t\t\t"+(int)totals[4][0]+
                "\r\nTotal for
6:\t\t\t\t\t\t\t\t\t\t\t\t\t"+(int)totals[5][0]+

                "\r\n\r\nDATA FOR THE LAST WEEK\r\n"+
                "\r\nAverage for 1:\t\t\t\t\t\t\t\t\t\t
"+String.format(" % .1f ",totals[0][1]/7)+
                "\r\nAverage for 2:\t\t\t\t\t\t\t\t\t\t
"+String.format(" % .1f ",totals[1][1]/7)+
                "\r\nAverage for 3:\t\t\t\t\t\t\t\t\t\t
"+String.format(" % .1f ",totals[2][1]/7)+
                "\r\nAverage for 4:\t\t\t\t\t\t\t\t\t\t
"+String.format(" % .1f ",totals[3][1]/7)+
                "\r\nAverage for 5:\t\t\t\t\t\t\t\t\t\t
"+String.format(" % .1f ",totals[4][1]/7)+
                "\r\nAverage for 6:\t\t\t\t\t\t\t\t\t\t
"+String.format(" % .1f ",totals[5][1]/7)+

                "\r\n\r\nTotal for
1:\t\t\t\t\t\t\t\t\t\t\t\t\t"+(int)totals[0][1]+
                "\r\nTotal for
2:\t\t\t\t\t\t\t\t\t\t\t\t\t"+(int)totals[1][1]+
```

```
                "\r\nTotal for
3:\t\t\t\t\t\t\t\t\t\t\t\t\t"+(int)totals[2][1]+
                "\r\nTotal for
4:\t\t\t\t\t\t\t\t\t\t\t\t\t"+(int)totals[3][1]+
                "\r\nTotal for
5:\t\t\t\t\t\t\t\t\t\t\t\t\t"+(int)totals[4][1]+
                "\r\nTotal for
6:\t\t\t\t\t\t\t\t\t\t\t\t\t"+(int)totals[5][1]+

                "\r\n\r\nAverage
[mmol/L]:\t\t\t\t\t\t\t\t\t"+String.format("%.1f",(totalmmoll/number
))+
                "\r\nTotal
[mmol/L]:\t\t\t\t\t\t\t\t\t"+String.format("%.1f",totalmmoll)+


"\r\n\r\nQuantity:\t\t\t\t\t\t\t\t\t\t\t\t"+number+"\r\n\r\n\r\n"+
buffer;

        tv.setText(buffer);
    }

    private void insertrecords(){
        List<String> y = new ArrayList<String>();
        for(int i=1960;i<=2094;i++) y.add(Integer.toString(i));
        ArrayAdapter<String> dataAdapter = new
ArrayAdapter<String>(this, android.R.layout.simple_spinner_item, y);

dataAdapter.setDropDownViewResource(android.R.layout.simple_spinner_
dropdown_item);
        sy.setAdapter(dataAdapter);

        List<String> m=new ArrayList<String>();
        for(int i=1;i<=12;i++) m.add(Integer.toString(i));
        ArrayAdapter<String> dataAdapter2 = new
ArrayAdapter<String>(this, android.R.layout.simple_spinner_item, m);

dataAdapter2.setDropDownViewResource(android.R.layout.simple_spinner
_dropdown_item);
        sm.setAdapter(dataAdapter2);

        insertrecords2();
    }

    private void insertrecords2(){
        int max=0;

if(sm.getSelectedItem().equals("1")||sm.getSelectedItem().equals("3"
)||sm.getSelectedItem().equals("5")||
```

```
sm.getSelectedItem().equals("7")||sm.getSelectedItem().equals("8")||

sm.getSelectedItem().equals("10")||sm.getSelectedItem().equals("12")
) max=31;
        else
if(sm.getSelectedItem().equals("4")||sm.getSelectedItem().equals("6"
)||

sm.getSelectedItem().equals("9")||sm.getSelectedItem().equals("11"))
max=30;
        else {

if((Integer.parseInt(sy.getSelectedItem().toString())%4==0 &&

Integer.parseInt(sy.getSelectedItem().toString())!=0)||

Integer.parseInt(sy.getSelectedItem().toString())%400==0) max=29;
            else max=28;
        }
        List<String> d=new ArrayList<String>();
        for(int i=1;i<=max;i++) d.add(Integer.toString(i));
        ArrayAdapter<String> dataAdapter3 = new
ArrayAdapter<String>(this, android.R.layout.simple_spinner_item, d);

dataAdapter3.setDropDownViewResource(android.R.layout.simple_spinner
_dropdown_item);
        sd.setAdapter(dataAdapter3);
    }

    private void currentDate(){
        Calendar now=Calendar.getInstance();
        sy.setSelection(now.get(Calendar.YEAR)-1960);
        sm.setSelection(now.get(Calendar.MONTH));
        sd.setSelection(now.get(Calendar.DAY_OF_MONTH));
    }
}
```

Listing 8: The source code for UpdateOneTest.java file [own study]

```
<?xml version="1.0" encoding="utf-8"?>
<androidx.constraintlayout.widget.ConstraintLayout
xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:app="http://schemas.android.com/apk/res-auto"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    tools:context=".AddOneDay">
```

```
<LinearLayout
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    android:orientation="vertical">

    <LinearLayout
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:orientation="horizontal">

        <TextView
            android:id="@+id/textView"
            android:layout_width="wrap_content"
            android:layout_height="wrap_content"
            android:layout_weight="1"
            android:text="Enter the date:" />

        <Spinner
            android:id="@+id/syear"
            android:layout_width="wrap_content"
            android:layout_height="wrap_content"
            android:layout_weight="1" />

        <Spinner
            android:id="@+id/smonth"
            android:layout_width="wrap_content"
            android:layout_height="wrap_content"
            android:layout_weight="1" />

        <Spinner
            android:id="@+id/sday"
            android:layout_width="wrap_content"
            android:layout_height="wrap_content"
            android:layout_weight="1" />
    </LinearLayout>

    <LinearLayout
        android:layout_width="match_parent"
        android:layout_height="wrap_content"
        android:orientation="vertical">

        <EditText
            android:id="@+id/et1"
            android:layout_width="match_parent"
            android:layout_height="wrap_content"
            android:editable="false"
            android:ems="10"
            android:hint="1"
```

```
    android:inputType="number"
    android:numeric="integer" />

<EditText
    android:id="@+id/et2"
    android:layout_width="match_parent"
    android:layout_height="wrap_content"
    android:editable="false"
    android:ems="10"
    android:hint="2"
    android:inputType="number"
    android:numeric="integer" />

<EditText
    android:id="@+id/et3"
    android:layout_width="match_parent"
    android:layout_height="wrap_content"
    android:editable="false"
    android:ems="10"
    android:hint="3"
    android:inputType="number"
    android:numeric="integer" />

<EditText
    android:id="@+id/et4"
    android:layout_width="match_parent"
    android:layout_height="wrap_content"
    android:editable="false"
    android:ems="10"
    android:hint="4"
    android:inputType="number"
    android:numeric="integer" />

<EditText
    android:id="@+id/et5"
    android:layout_width="match_parent"
    android:layout_height="wrap_content"
    android:editable="false"
    android:ems="10"
    android:hint="5"
    android:inputType="number"
    android:numeric="integer" />

<EditText
    android:id="@+id/et6"
    android:layout_width="match_parent"
    android:layout_height="wrap_content"
    android:editable="false"
    android:ems="10"
```

```
                android:hint="6"
                android:inputType="number"
                android:numeric="integer" />
        </LinearLayout>

        <LinearLayout
            android:layout_width="wrap_content"
            android:layout_height="wrap_content"
            android:orientation="horizontal">

            <ImageButton
                android:id="@+id/imgbtnback"
                android:layout_width="wrap_content"
                android:layout_height="wrap_content"
                app:srcCompat="@drawable/ic_arrow_back_black_24dp"
/>

            <ImageButton
                android:id="@+id/imgbtnsend"
                android:layout_width="wrap_content"
                android:layout_height="wrap_content"
                app:srcCompat="@drawable/ic_send_black_24dp" />

        </LinearLayout>

    </LinearLayout>
</androidx.constraintlayout.widget.ConstraintLayout>
```

Listing 9: The source code for activity_add_one_day.xml file [own study]

```
<?xml version="1.0" encoding="utf-8"?>
<androidx.constraintlayout.widget.ConstraintLayout
xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:app="http://schemas.android.com/apk/res-auto"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    tools:context=".AddOneWeek">

    <LinearLayout
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:orientation="vertical">

        <LinearLayout
            android:layout_width="wrap_content"
            android:layout_height="wrap_content"
            android:orientation="horizontal">
```

```
    <TextView
        android:id="@+id/textView"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_weight="1"
        android:text="Enter the date:" />

    <Spinner
        android:id="@+id/syear"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_weight="1" />

    <Spinner
        android:id="@+id/smonth"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_weight="1" />

    <Spinner
        android:id="@+id/sday"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:layout_weight="1" />
</LinearLayout>

<LinearLayout
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:orientation="horizontal">

    <EditText
        android:id="@+id/et1"
        android:layout_width="50dp"
        android:layout_height="wrap_content"
        android:editable="false"
        android:ems="10"
        android:hint="1"
        android:inputType="number"
        android:numeric="integer" />

    <EditText
        android:id="@+id/et2"
        android:layout_width="50dp"
        android:layout_height="wrap_content"
        android:editable="false"
        android:ems="10"
        android:hint="2"
```

```
            android:inputType="number"
            android:numeric="integer" />

        <EditText
            android:id="@+id/et3"
            android:layout_width="50dp"
            android:layout_height="wrap_content"
            android:editable="false"
            android:ems="10"
            android:hint="3"
            android:inputType="number"
            android:numeric="integer" />

        <EditText
            android:id="@+id/et4"
            android:layout_width="50dp"
            android:layout_height="wrap_content"
            android:editable="false"
            android:ems="10"
            android:hint="4"
            android:inputType="number"
            android:numeric="integer" />

        <EditText
            android:id="@+id/et5"
            android:layout_width="50dp"
            android:layout_height="wrap_content"
            android:editable="false"
            android:ems="10"
            android:hint="5"
            android:inputType="number"
            android:numeric="integer" />

        <EditText
            android:id="@+id/et6"
            android:layout_width="50dp"
            android:layout_height="wrap_content"
            android:editable="false"
            android:ems="10"
            android:hint="6"
            android:inputType="number"
            android:numeric="integer" />
    </LinearLayout>

    <LinearLayout
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:orientation="horizontal">
```

```
<EditText
    android:id="@+id/et7"
    android:layout_width="50dp"
    android:layout_height="wrap_content"
    android:editable="false"
    android:ems="10"
    android:hint="7"
    android:inputType="number"
    android:numeric="integer" />

<EditText
    android:id="@+id/et8"
    android:layout_width="50dp"
    android:layout_height="wrap_content"
    android:editable="false"
    android:ems="10"
    android:hint="8"
    android:inputType="number"
    android:numeric="integer" />

<EditText
    android:id="@+id/et9"
    android:layout_width="50dp"
    android:layout_height="wrap_content"
    android:editable="false"
    android:ems="10"
    android:hint="9"
    android:inputType="number"
    android:numeric="integer" />

<EditText
    android:id="@+id/et10"
    android:layout_width="50dp"
    android:layout_height="wrap_content"
    android:editable="false"
    android:ems="10"
    android:hint="10"
    android:inputType="number"
    android:numeric="integer" />

<EditText
    android:id="@+id/et11"
    android:layout_width="50dp"
    android:layout_height="wrap_content"
    android:editable="false"
    android:ems="10"
    android:hint="11"
    android:inputType="number"
    android:numeric="integer" />
```

```
    <EditText
        android:id="@+id/et12"
        android:layout_width="50dp"
        android:layout_height="wrap_content"
        android:editable="false"
        android:ems="10"
        android:hint="12"
        android:inputType="number"
        android:numeric="integer" />
</LinearLayout>

<LinearLayout
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:orientation="horizontal">

    <EditText
        android:id="@+id/et13"
        android:layout_width="50dp"
        android:layout_height="wrap_content"
        android:editable="false"
        android:ems="10"
        android:hint="13"
        android:inputType="number"
        android:numeric="integer" />

    <EditText
        android:id="@+id/et14"
        android:layout_width="50dp"
        android:layout_height="wrap_content"
        android:editable="false"
        android:ems="10"
        android:hint="14"
        android:inputType="number"
        android:numeric="integer" />

    <EditText
        android:id="@+id/et15"
        android:layout_width="50dp"
        android:layout_height="wrap_content"
        android:editable="false"
        android:ems="10"
        android:hint="15"
        android:inputType="number"
        android:numeric="integer" />

    <EditText
        android:id="@+id/et16"
```

```
            android:layout_width="50dp"
            android:layout_height="wrap_content"
            android:editable="false"
            android:ems="10"
            android:hint="16"
            android:inputType="number"
            android:numeric="integer" />

        <EditText
            android:id="@+id/et17"
            android:layout_width="50dp"
            android:layout_height="wrap_content"
            android:editable="false"
            android:ems="10"
            android:hint="17"
            android:inputType="number"
            android:numeric="integer" />

        <EditText
            android:id="@+id/et18"
            android:layout_width="50dp"
            android:layout_height="wrap_content"
            android:editable="false"
            android:ems="10"
            android:hint="18"
            android:inputType="number"
            android:numeric="integer" />
    </LinearLayout>

    <LinearLayout
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:orientation="horizontal">

        <EditText
            android:id="@+id/et19"
            android:layout_width="50dp"
            android:layout_height="wrap_content"
            android:editable="false"
            android:ems="1"
            android:hint="19"
            android:inputType="number"
            android:numeric="integer" />

        <EditText
            android:id="@+id/et20"
            android:layout_width="50dp"
            android:layout_height="wrap_content"
            android:editable="false"
```

```
            android:ems="10"
            android:hint="20"
            android:inputType="number"
            android:numeric="integer" />

        <EditText
            android:id="@+id/et21"
            android:layout_width="50dp"
            android:layout_height="wrap_content"
            android:editable="false"
            android:ems="10"
            android:hint="21"
            android:inputType="number"
            android:numeric="integer" />

        <EditText
            android:id="@+id/et22"
            android:layout_width="50dp"
            android:layout_height="wrap_content"
            android:editable="false"
            android:ems="10"
            android:hint="22"
            android:inputType="number"
            android:numeric="integer" />

        <EditText
            android:id="@+id/et23"
            android:layout_width="50dp"
            android:layout_height="wrap_content"
            android:editable="false"
            android:ems="10"
            android:hint="23"
            android:inputType="number"
            android:numeric="integer" />

        <EditText
            android:id="@+id/et24"
            android:layout_width="50dp"
            android:layout_height="wrap_content"
            android:editable="false"
            android:ems="10"
            android:hint="24"
            android:inputType="number"
            android:numeric="integer" />
    </LinearLayout>

    <LinearLayout
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
```

```
android:orientation="horizontal">

<EditText
    android:id="@+id/et25"
    android:layout_width="50dp"
    android:layout_height="wrap_content"
    android:editable="false"
    android:ems="10"
    android:hint="25"
    android:inputType="number"
    android:numeric="integer" />

<EditText
    android:id="@+id/et26"
    android:layout_width="50dp"
    android:layout_height="wrap_content"
    android:editable="false"
    android:ems="10"
    android:hint="26"
    android:inputType="number"
    android:numeric="integer" />

<EditText
    android:id="@+id/et27"
    android:layout_width="50dp"
    android:layout_height="wrap_content"
    android:editable="false"
    android:ems="10"
    android:hint="27"
    android:inputType="number"
    android:numeric="integer" />

<EditText
    android:id="@+id/et28"
    android:layout_width="50dp"
    android:layout_height="wrap_content"
    android:editable="false"
    android:ems="10"
    android:hint="28"
    android:inputType="number"
    android:numeric="integer" />

<EditText
    android:id="@+id/et29"
    android:layout_width="50dp"
    android:layout_height="wrap_content"
    android:editable="false"
    android:ems="10"
    android:hint="29"
```

```
            android:inputType="number"
            android:numeric="integer" />

        <EditText
            android:id="@+id/et30"
            android:layout_width="50dp"
            android:layout_height="wrap_content"
            android:editable="false"
            android:ems="10"
            android:hint="30"
            android:inputType="number"
            android:numeric="integer" />
    </LinearLayout>

    <LinearLayout
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:orientation="horizontal">

        <EditText
            android:id="@+id/et31"
            android:layout_width="50dp"
            android:layout_height="wrap_content"
            android:editable="false"
            android:ems="10"
            android:hint="31"
            android:inputType="number"
            android:numeric="integer" />

        <EditText
            android:id="@+id/et32"
            android:layout_width="50dp"
            android:layout_height="wrap_content"
            android:editable="false"
            android:ems="10"
            android:hint="32"
            android:inputType="number"
            android:numeric="integer" />

        <EditText
            android:id="@+id/et33"
            android:layout_width="50dp"
            android:layout_height="wrap_content"
            android:editable="false"
            android:ems="10"
            android:hint="33"
            android:inputType="number"
            android:numeric="integer" />
```

```
    <EditText
        android:id="@+id/et34"
        android:layout_width="50dp"
        android:layout_height="wrap_content"
        android:editable="false"
        android:ems="10"
        android:hint="34"
        android:inputType="number"
        android:numeric="integer" />

    <EditText
        android:id="@+id/et35"
        android:layout_width="50dp"
        android:layout_height="wrap_content"
        android:editable="false"
        android:ems="10"
        android:hint="35"
        android:inputType="number"
        android:numeric="integer" />

    <EditText
        android:id="@+id/et36"
        android:layout_width="50dp"
        android:layout_height="wrap_content"
        android:editable="false"
        android:ems="10"
        android:hint="36"
        android:inputType="number"
        android:numeric="integer" />
</LinearLayout>

<LinearLayout
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:orientation="horizontal">

    <EditText
        android:id="@+id/et37"
        android:layout_width="50dp"
        android:layout_height="wrap_content"
        android:editable="false"
        android:ems="10"
        android:hint="37"
        android:inputType="number"
        android:numeric="integer" />

    <EditText
        android:id="@+id/et38"
        android:layout_width="50dp"
```

```
            android:layout_height="wrap_content"
            android:editable="false"
            android:ems="10"
            android:hint="38"
            android:inputType="number"
            android:numeric="integer" />

        <EditText
            android:id="@+id/et39"
            android:layout_width="50dp"
            android:layout_height="wrap_content"
            android:editable="false"
            android:ems="10"
            android:hint="39"
            android:inputType="number"
            android:numeric="integer" />

        <EditText
            android:id="@+id/et40"
            android:layout_width="50dp"
            android:layout_height="wrap_content"
            android:editable="false"
            android:ems="10"
            android:hint="40"
            android:inputType="number"
            android:numeric="integer" />

        <EditText
            android:id="@+id/et41"
            android:layout_width="50dp"
            android:layout_height="wrap_content"
            android:editable="false"
            android:ems="10"
            android:hint="41"
            android:inputType="number"
            android:numeric="integer" />

        <EditText
            android:id="@+id/et42"
            android:layout_width="50dp"
            android:layout_height="wrap_content"
            android:editable="false"
            android:ems="10"
            android:hint="42"
            android:inputType="number"
            android:numeric="integer" />
    </LinearLayout>

    <LinearLayout
```

```
            android:layout_width="wrap_content"
            android:layout_height="wrap_content"
            android:orientation="horizontal">

            <ImageButton
                android:id="@+id/imgbtnback"
                android:layout_width="wrap_content"
                android:layout_height="wrap_content"
                app:srcCompat="@drawable/ic_arrow_back_black_24dp"
/>

            <ImageButton
                android:id="@+id/imgbtnsend"
                android:layout_width="wrap_content"
                android:layout_height="wrap_content"
                app:srcCompat="@drawable/ic_send_black_24dp" />

        </LinearLayout>

    </LinearLayout>
</androidx.constraintlayout.widget.ConstraintLayout>
```

Listing 10: The source code for activity_add_one_week.xml file [own study]

```
<?xml version="1.0" encoding="utf-8"?>
<androidx.constraintlayout.widget.ConstraintLayout
xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:app="http://schemas.android.com/apk/res-auto"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    tools:context=".Graph">

    <com.github.mikephil.charting.charts.LineChart
        android:id="@+id/lineChart"
        android:layout_width="fill_parent"
        android:layout_height="fill_parent" />

</androidx.constraintlayout.widget.ConstraintLayout>
```

Listing 11: The source code for activity_graph.xml file [own study]

```
<?xml version="1.0" encoding="utf-8"?>
<androidx.constraintlayout.widget.ConstraintLayout
xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:app="http://schemas.android.com/apk/res-auto"
    xmlns:tools="http://schemas.android.com/tools"
```

```
android:layout_width="match_parent"
android:layout_height="match_parent"
tools:context=".MainActivity">

<LinearLayout
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    android:gravity="center"
    android:orientation="vertical">

    <ImageButton
        android:id="@+id/imgbtnshow"
        android:layout_width="match_parent"
        android:layout_height="wrap_content"
        app:srcCompat="@drawable/ic_slideshow_black_24dp" />

    <ImageButton
        android:id="@+id/imgbtngraph"
        android:layout_width="match_parent"
        android:layout_height="wrap_content"
        app:srcCompat="@drawable/ic_timeline_black_24dp" />

    <ImageButton
        android:id="@+id/imgbtnsearching"
        android:layout_width="match_parent"
        android:layout_height="wrap_content"
        app:srcCompat="@drawable/ic_search_black_24dp" />

    <ImageButton
        android:id="@+id/imgbtnadd1"
        android:layout_width="match_parent"
        android:layout_height="wrap_content"
        app:srcCompat="@drawable/ic_add_black_24dp" />

    <ImageButton
        android:id="@+id/imgbtnadd7"
        android:layout_width="match_parent"
        android:layout_height="wrap_content"
        app:srcCompat="@drawable/ic_playlist_add_black_24dp" />

    <ImageButton
        android:id="@+id/imgbtnupdate"
        android:layout_width="match_parent"
        android:layout_height="wrap_content"
        app:srcCompat="@drawable/ic_update_black_24dp" />

    <ImageButton
        android:id="@+id/imgbtnexit"
        android:layout_width="match_parent"
```

```
            android:layout_height="wrap_content"
            app:srcCompat="@drawable/ic_exit_to_app_black_24dp" />

    </LinearLayout>

</androidx.constraintlayout.widget.ConstraintLayout>
```

Listing 12: The source code for activity_main.xml file [own study]

```
<?xml version="1.0" encoding="utf-8"?>
<androidx.constraintlayout.widget.ConstraintLayout
xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:app="http://schemas.android.com/apk/res-auto"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    tools:context=".Searching">

    <ScrollView
        android:layout_width="match_parent"
        android:layout_height="match_parent">

        <LinearLayout
            android:layout_width="match_parent"
            android:layout_height="wrap_content"
            android:orientation="vertical" >

            <RadioGroup
                android:layout_width="match_parent"
                android:layout_height="match_parent" >

                <RadioButton
                    android:id="@+id/rB1"
                    android:layout_width="match_parent"
                    android:layout_height="wrap_content"
                    android:onClick="onRadioButtonClicked"
                    android:text="Single value" />

                <RadioButton
                    android:id="@+id/rB2"
                    android:layout_width="match_parent"
                    android:layout_height="wrap_content"
                    android:onClick="onRadioButtonClicked"
                    android:text="The range of values" />
            </RadioGroup>

            <EditText
                android:id="@+id/etmin"
```

```
                android:layout_width="match_parent"
                android:layout_height="wrap_content"
                android:ems="10"
                android:inputType="number"
                android:numeric="integer" />

            <EditText
                android:id="@+id/etmax"
                android:layout_width="match_parent"
                android:layout_height="wrap_content"
                android:ems="10"
                android:inputType="number"
                android:numeric="integer" />

            <LinearLayout
                android:layout_width="match_parent"
                android:layout_height="match_parent"
                android:orientation="horizontal">

                <ImageButton
                    android:id="@+id/imgbtnsearching"
                    android:layout_width="wrap_content"
                    android:layout_height="wrap_content"
                    app:srcCompat="@drawable/ic_search_black_24dp"
/>

                <ImageButton
                    android:id="@+id/imgbtnfinish"
                    android:layout_width="wrap_content"
                    android:layout_height="wrap_content"

app:srcCompat="@drawable/ic_exit_to_app_black_24dp" />

            </LinearLayout>

            <TextView
                android:id="@+id/tvsearching"
                android:layout_width="match_parent"
                android:layout_height="wrap_content" />
        </LinearLayout>
    </ScrollView>
</androidx.constraintlayout.widget.ConstraintLayout>
```

Listing 13: The source code for activity_searching.xml file [own study]

```
<?xml version="1.0" encoding="utf-8"?>
<androidx.coordinatorlayout.widget.CoordinatorLayout
xmlns:android="http://schemas.android.com/apk/res/android"
```

```
    xmlns:app="http://schemas.android.com/apk/res-auto"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    android:fitsSystemWindows="true"
    tools:context=".ShowingActivity">

    <com.google.android.material.appbar.AppBarLayout
        android:id="@+id/app_bar"
        android:layout_width="match_parent"
        android:layout_height="@dimen/app_bar_height"
        android:fitsSystemWindows="true"
        android:theme="@style/AppTheme.AppBarOverlay">

        <com.google.android.material.appbar.CollapsingToolbarLayout
            android:id="@+id/toolbar_layout"
            android:layout_width="match_parent"
            android:layout_height="match_parent"
            android:fitsSystemWindows="true"
            app:contentScrim="?attr/colorPrimary"
            app:layout_scrollFlags="scroll|exitUntilCollapsed"
            app:toolbarId="@+id/toolbar">

            <androidx.appcompat.widget.Toolbar
                android:id="@+id/toolbar"
                android:layout_width="match_parent"
                android:layout_height="?attr/actionBarSize"
                app:layout_collapseMode="pin"
                app:popupTheme="@style/AppTheme.PopupOverlay" />


</com.google.android.material.appbar.CollapsingToolbarLayout>
    </com.google.android.material.appbar.AppBarLayout>

    <include layout="@layout/content_showing" />

</androidx.coordinatorlayout.widget.CoordinatorLayout>
```

Listing 14: The source code for activity_showing.xml file [own study]

```
<?xml version="1.0" encoding="utf-8"?>
<androidx.constraintlayout.widget.ConstraintLayout
xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:app="http://schemas.android.com/apk/res-auto"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    tools:context=".UpdateOneTest">
```

```
<LinearLayout
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    android:orientation="vertical">

    <LinearLayout
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:orientation="horizontal">

        <TextView
            android:id="@+id/textView"
            android:layout_width="wrap_content"
            android:layout_height="wrap_content"
            android:layout_weight="1"
            android:text="Enter the date:" />

        <Spinner
            android:id="@+id/syear"
            android:layout_width="wrap_content"
            android:layout_height="wrap_content"
            android:layout_weight="1" />

        <Spinner
            android:id="@+id/smonth"
            android:layout_width="wrap_content"
            android:layout_height="wrap_content"
            android:layout_weight="1" />

        <Spinner
            android:id="@+id/sday"
            android:layout_width="wrap_content"
            android:layout_height="wrap_content"
            android:layout_weight="1" />
    </LinearLayout>

    <EditText
        android:id="@+id/etid"
        android:layout_width="match_parent"
        android:layout_height="wrap_content"
        android:editable="false"
        android:ems="10"
        android:hint="id"
        android:inputType="number"
        android:numeric="integer" />

    <EditText
        android:id="@+id/ett"
```

```
            android:layout_width="match_parent"
            android:layout_height="wrap_content"
            android:editable="false"
            android:ems="10"
            android:hint="test"
            android:inputType="number"
            android:numeric="integer" />

        <LinearLayout
            android:layout_width="wrap_content"
            android:layout_height="wrap_content"
            android:orientation="horizontal">

            <ImageButton
                android:id="@+id/imgbtnback"
                android:layout_width="wrap_content"
                android:layout_height="wrap_content"
                app:srcCompat="@drawable/ic_arrow_back_black_24dp"
/>

            <ImageButton
                android:id="@+id/imgbtnupdate"
                android:layout_width="wrap_content"
                android:layout_height="wrap_content"
                app:srcCompat="@drawable/ic_update_black_24dp" />

        </LinearLayout>

        <ScrollView
            android:layout_width="match_parent"
            android:layout_height="wrap_content">

            <LinearLayout
                android:layout_width="match_parent"
                android:layout_height="wrap_content"
                android:orientation="vertical">

                <TextView
                    android:id="@+id/tv"
                    android:layout_width="wrap_content"
                    android:layout_height="wrap_content" />
            </LinearLayout>
        </ScrollView>

    </LinearLayout>

</androidx.constraintlayout.widget.ConstraintLayout>
```

Listing 15: The source code for activity_update_one_test.xml file [own study]

```
<?xml version="1.0" encoding="utf-8"?>
<androidx.core.widget.NestedScrollView
xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:app="http://schemas.android.com/apk/res-auto"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    app:layout_behavior="@string/appbar_scrolling_view_behavior"
    tools:context=".ShowingActivity"
    tools:showIn="@layout/activity_showing">

    <TextView
        android:id="@+id/tv"
        android:layout_width="match_parent"
        android:layout_height="match_parent"
        android:layout_margin="@dimen/text_margin" />

</androidx.core.widget.NestedScrollView>
```

Listing 16: The source code for content_showing.xml file [own study]

List of drawings

List of listings

Bibliography:

[1] https://pl.wikipedia.org/wiki/Hemoglobina_glikowana
[2] https://www.mojacukrzyca.org/?a=text&id=641