CA400 User Manual

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0.1 Introduction

Welcome to the Nurse Workload Measurement System !
This app was designed and created to help keep track of how much work is being done in different parts of the hospital. Work is a difficult thing to measure. We know how hard it is to answer the question, “how busy is Ward A right now?” or “how busy was our surgical department last November?”. We also know how important these questions are for hospital staff to be able to compare and contrast the work being done on different days in different sections of the hospital. Without being able to specify how much work is required today, it is hard to plan and prepare for how much work will likely be required tomorrow, or next month, or next year!

The Nurse Workload Measurement System answers these questions for you and gives you figures to work with so you can plan for a better prepared future. It records the work nurses are doing for patients and returns a figure to represent how busy we are in this ward on this day. You can compare that with the figures for another ward, or another day to find patterns and trends and predict future work.

Our application will alleviate the task of trying to know how many nurses will be needed in which wards in order to write up a roster for each week. Our application also provides a Real Time analysis function to accommodate for sudden changes in workload which may require staff to be pulled from one ward to another when extra help is needed.

This app records the amount of work nurses do for each individual patient so that managers and directors of nursing can see what wards are busiest at any given time and can pull nurses form a quiet ward to send them to a busy ward that needs an extra pair of hands, or just so they can discover patterns and trends in workload to plan and prepare for the future better.

0.2 Overview

Here we will explain how the application represents the tasks it records work for, how it aligns the work with your own hospital arrangements, and how it calculates a workscore for patients and wards, based on the work logged.

Let’s take a look:
The main illustration you will need to be familiar with when using this application is the WorkSubModel. A WorkSubModel is a visual representation of a collection of tasks. It takes

the form of a diagram or illustration that looks similar to a wheel shape. Figure 1.1. is an example of a WorkSubModel.

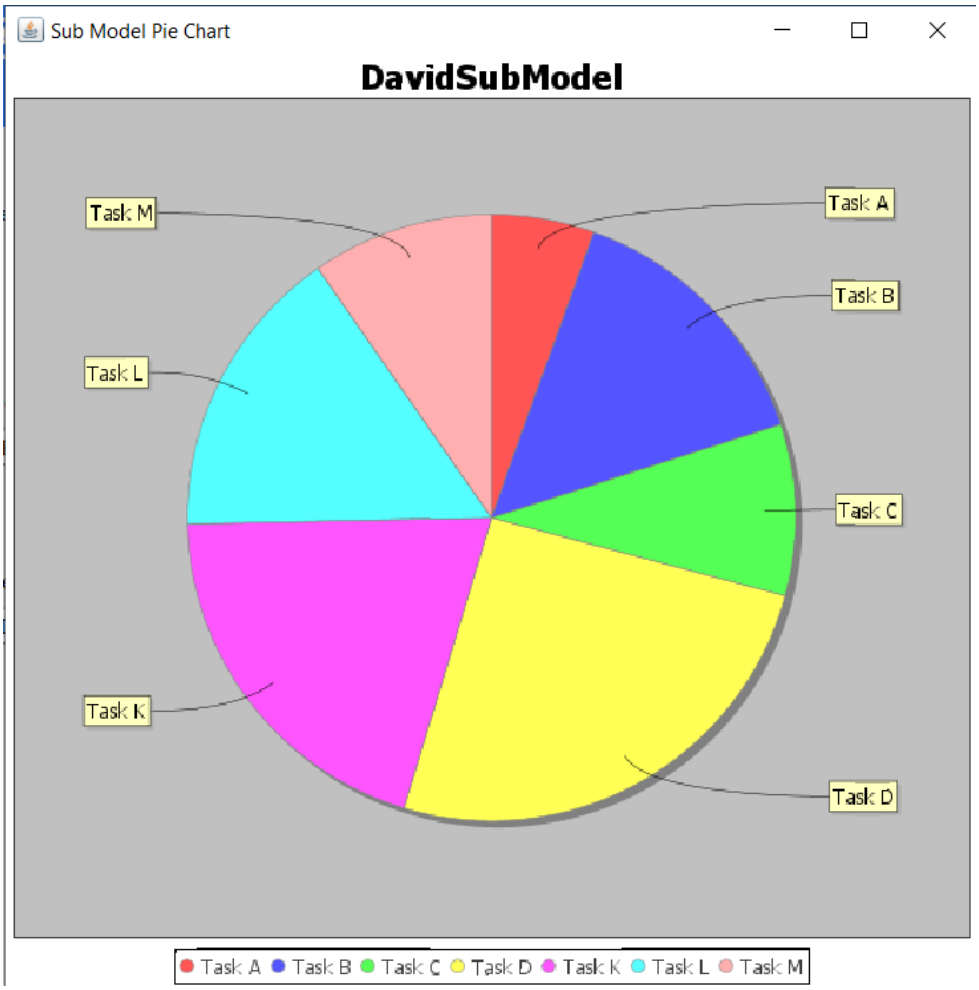


Figure 1.1.

Your first instinct may be to think of this as a pie chart. It does look like one but it is important to note that this is not a pie chart. A pie chart represents a collection of data whereas a WorkSubModel represents a list of tasks, there is no data behind these slices.

A WorkSubModel is essentially a list of tasks, but instead of the tasks being written out as words on paper, they are displayed alongside each other in a circle in this illustration. Each slice on the WorkSubModel represents a task that nurses perform for patients in a hospital; they are labeled. The different sizes of the slices represent the varying levels of intensity required or in other words the varying amount of time/effort required or in other words the varying amount of *work* required **in general** for each of these tasks, with respect to each other.

We need to acknowledge here that no singular task or job requires the same amount of work every single time. Asking how much work is required for some job X is like asking how long is a piece of string ! We recognize that the amount of time and effort required to perform some task on a patient varies greatly depending on many factors, such as patient's mental or physical state, patient's responsiveness, patient's cooperation level, the degree of the

patient's illness, and many more. It is very hard to give a deterministic statement or figure on *exactly* how much work goes into any one task, for example changing a wound dressing for a patient. It depends on how big the wound is, how fresh the wound is, how accessible of a place is the area of the body where the wound exists, how neat vs rugged the cut was made, etc.

As our application provides a way to measure how much work goes into each task on each occasion that the task is performed, it is important to know first which tasks are *generally* easier or harder than others. The size of the task's slice on the WorkSubModel provides a *general* idea of which tasks *roughly* require more work than others, even when it is difficult to say exactly how much work was required to complete it.

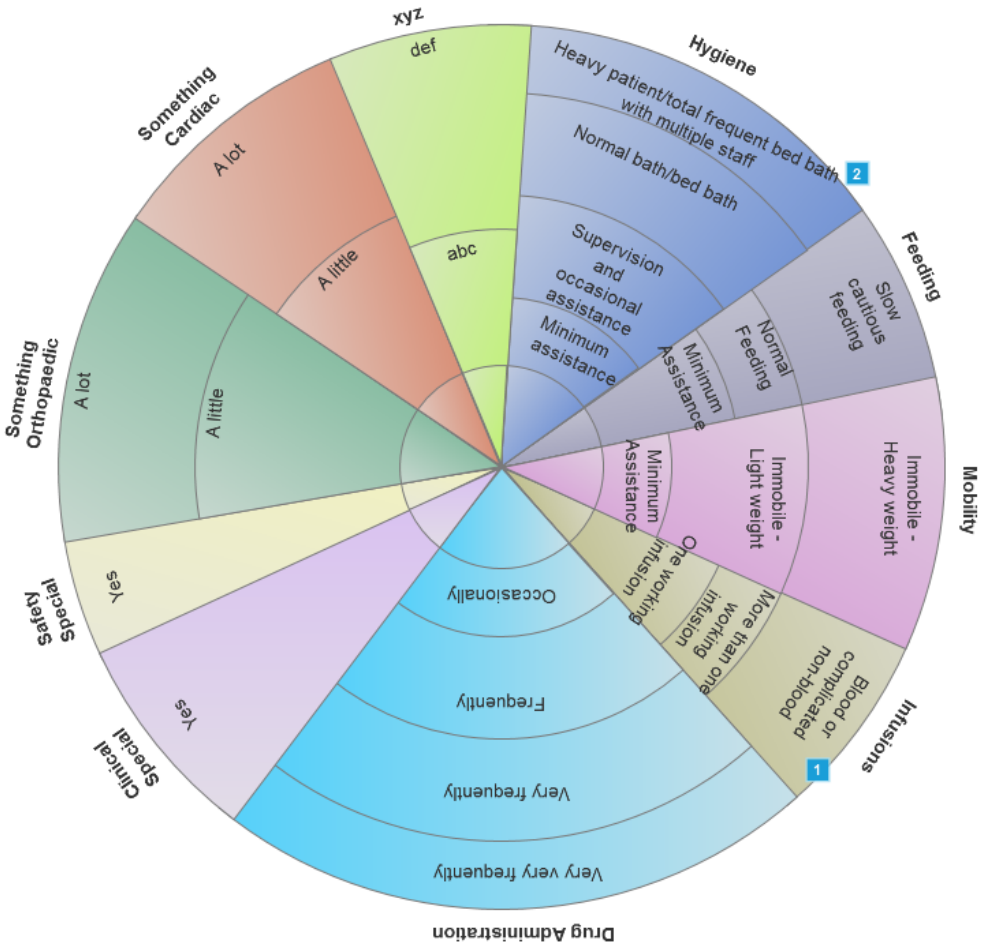
From our WorkSubModel above (Figure 1.1.), we can see that Task C is a pretty small task in relation to all the other tasks presented in the WorkSubModel. Task C may represent a simple thing like checking a patient's vital signs. Task K on the other hand is a large task that requires a lot of work in relation to the other tasks in the WorkSubModel. Task D may represent something like prepping a patient for an urgent, immediate, unexpected kidney transplant.

Of course, knowing how much work is *generally* required for each task is not enough to accurately measure the work going on in the hospital. We need to account for the varying levels of intensity that each of these tasks could require in different scenarios. For this reason, each task on a WorkSubModel contains some number of "bands". If you were to break up one task into the different levels of intensity it commonly requires, each of these descriptions would be equivalent to one band. Bands are like levels on a spectrum. We will use an example to explain.

For the task of a patient's personal hygiene, there are a number of different scenarios which would each demand different amounts of work from the nurse.

- If a patient can wash themselves, then no work is required from the nurses.
- If a patient needs assistance to and from the washroom, but can wash themselves unattended once they are there, a small amount of work is required from the nurses.
- If a patient needs assistance to the washroom and cannot wash themselves so the nurses must do it for them, quite a lot of work (time and effort) is required from the nurses.
- If a patient cannot move from their bed and the nurses must give them a bed bath, that is a very big job for the nurses and a large amount of work is required from them.

Each of these scenarios describe a different level of work on the spectrum of work required for this task. In our application, you will use this WorkSubModel to log the work you have performed on patients. Below is an example of a WorkSubModel with the bands for each task displayed on the slice.



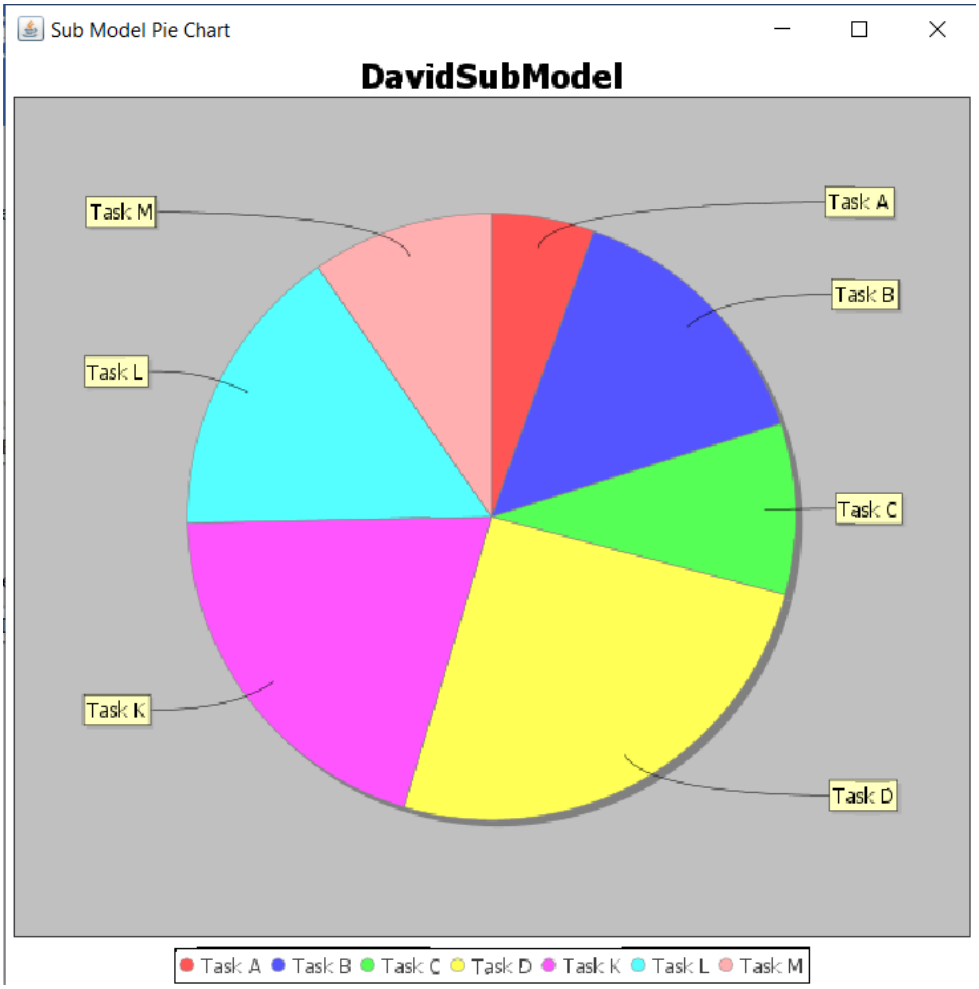
The task examples and their bands in this illustration are purely for demonstration purposes and will not precisely reflect the tasks and bands in the WorkSubModels you will use in your instance of our application.

Some tasks only have two bands, they are simply done or not done. Clinical Special, and Safety Special have these characteristics in our example above. Some tasks only have three bands, such as Something Orthopaedic. It could be that no work is performed, a little work is performed, or a lot of work is performed. Some tasks, such as Personal Hygiene in this example have many bands.

What do these WorkSubModels do ?

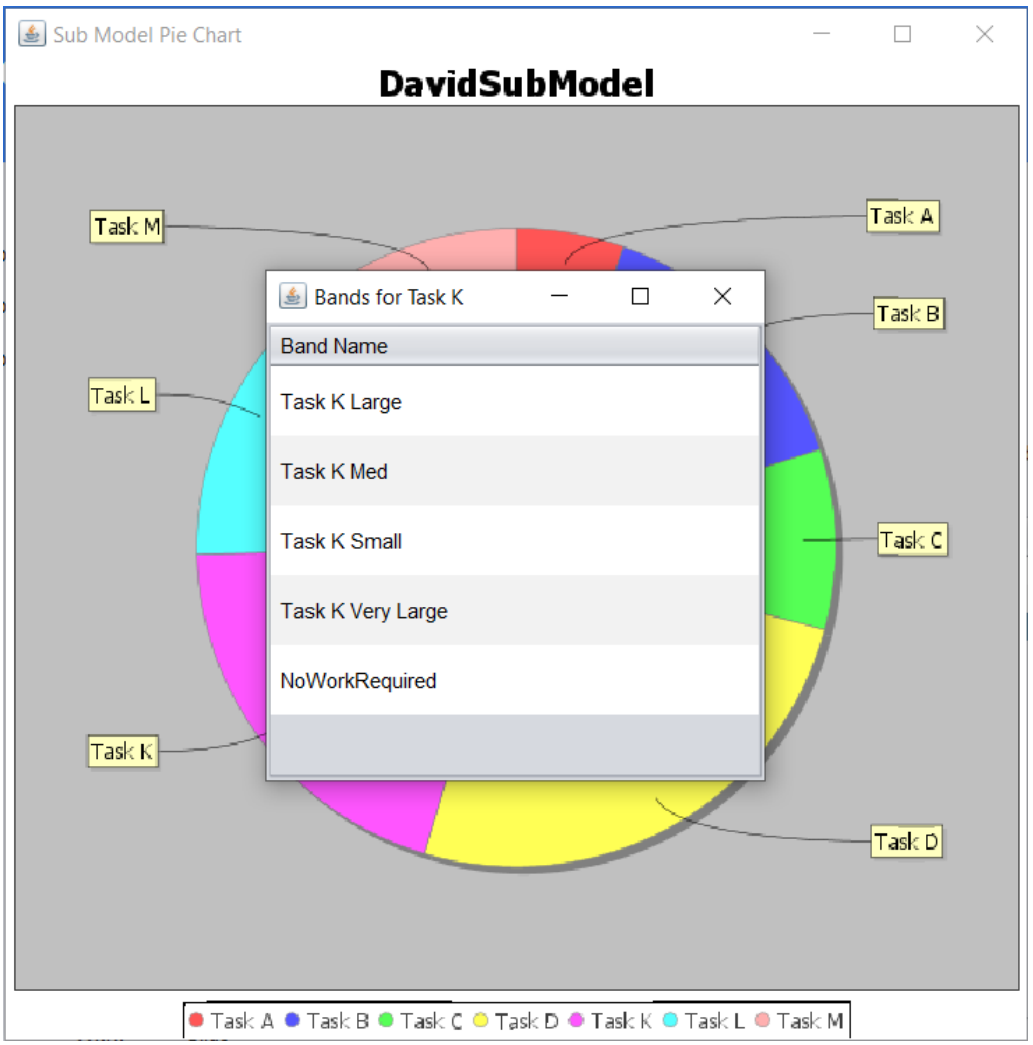
You will create numerous different WorkSubModels while you use our application. You will need a WorkSubModel assigned to every ward in your hospital. The WorkSubModel for any one ward will contain the tasks that are most commonly performed on patients in that ward. Any one ward can only use one WorkSubModel, but one WorkSubModel can be used by more than one ward. If two or more wards cater for the same areas of care, they can make use of the same WorkSubModel.

Let us look back at the generic example we saw earlier.

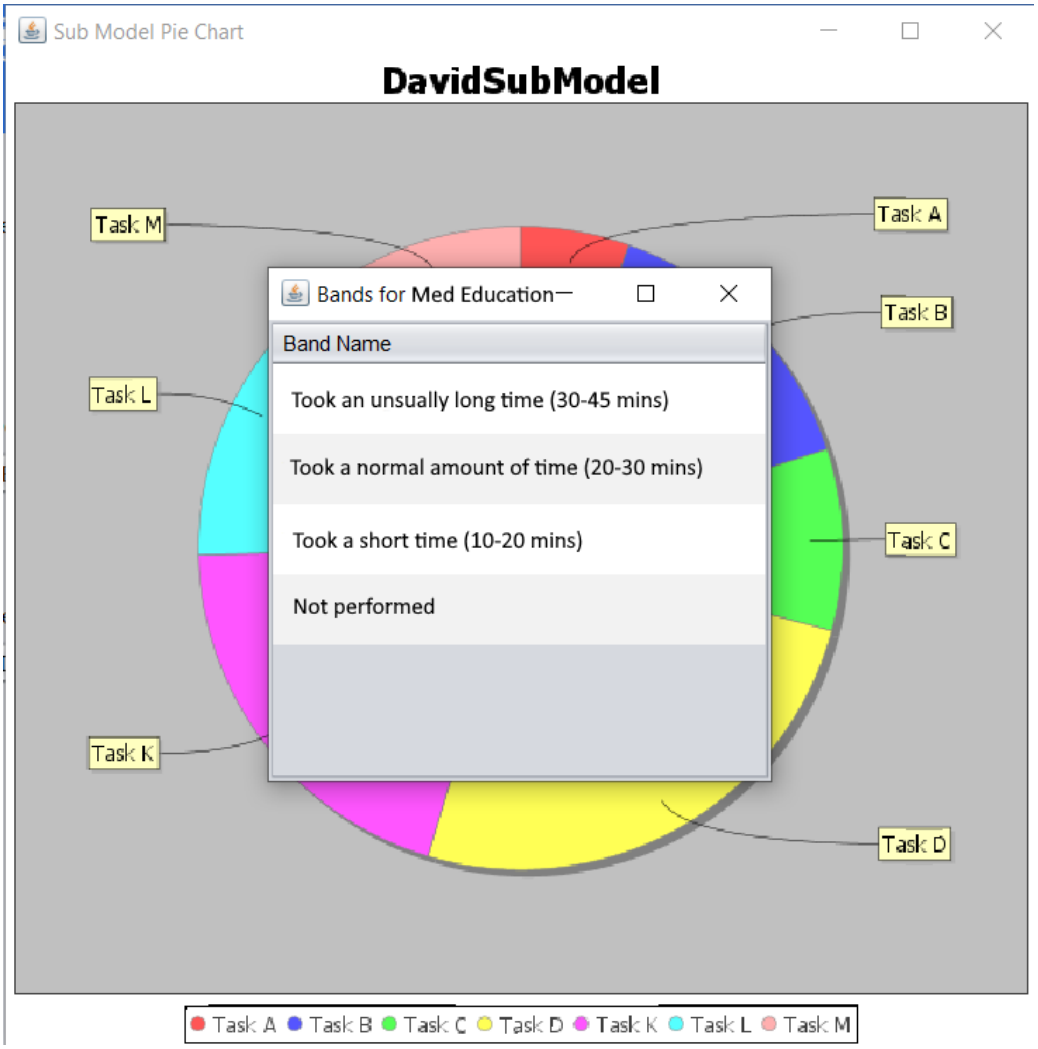


Again, we will assume that some one task here is checking vital signs (probably Task C, judging by its size), and some other task is prepping a patient for a kidney transplant (probably Task D, judging by its size). We can assume that the WorkSubModel used in this example is one assigned to a kidney transplant ward. The other tasks might be things such as wound care post-operation (looks like this could be Task M), medication education for the new medication that patients must take throughout their life after a kidney transplant (this education is highly important and needs to be very clearly understood and takes a lot of time to explain to patients so this could be Task K), emptying the patient's urine catheter (could be Task A because it is small), etc.

During each work shift on a ward, a nurse will log the tasks they performed for each of their patients during that shift. To do this, a nurse will open our application, select a ward and a patient and the WorkSubModel assigned to that ward will appear on the screen. The nurse will select each task (slice) one at a time. For each task selected, they will be presented with a list of scenarios (bands) to describe how much work was required for this specific task for this patient during this particular shift. The bands will look something like this:



The wording of each band will be more realistic and specifically describe the scenario that each band represents. For example, if we take the medication education task, the bands might describe how many minutes were spent educating the patient on their new medicine. The bands could look something like this:



The nurse will select the band that best describes how much work they had to put into this task for this patient during this work shift. That will be work logged for the task of Medication Education. Then, the nurse will select another task, will be presented with a set of bands that describe the different possible scenarios of how that task went, and they will select the band that best describes the work for this work shift.

What does the "sub" in WorkSubModel refer to?

By now we know a WorkSubModel is essentially a list of tasks that are performed in a certain ward, and that they are displayed around in a circle on a wheel shaped illustration. A WorkSubModel has a slice to represent each task that is performed in the ward(s) that uses this WorkSubModel. Some tasks, such as checking vital signs, are performed in every ward, so they will exist in all of the WorkSubModels (there is one WorkSubModel assigned to each ward). Some tasks, such as kidney transplant preoperative preparation are specific tasks performed on specific wards so it would exist only in the WorkSubModel that the kidney transplant ward is using.

When we are logging the work that is done in each ward, we want to account for the fact that the vital signs on the surgical ward is the same task as the vital signs on the kidney transplant ward. To accommodate this, we need to have a common pool of tasks which

includes every task ever performed on any patient in any ward all over the hospital. We want to be able to compare the work required from one ward to the next so they need to have a common standard to allow for fair comparison.

So, before we create any SubModels, we first create a WorkModel. This is the parent of all WorkSubModels that are created. It displays the collective list of all tasks that are performed in all the wards across the entire hospital. Here is an example of a WorkModel.

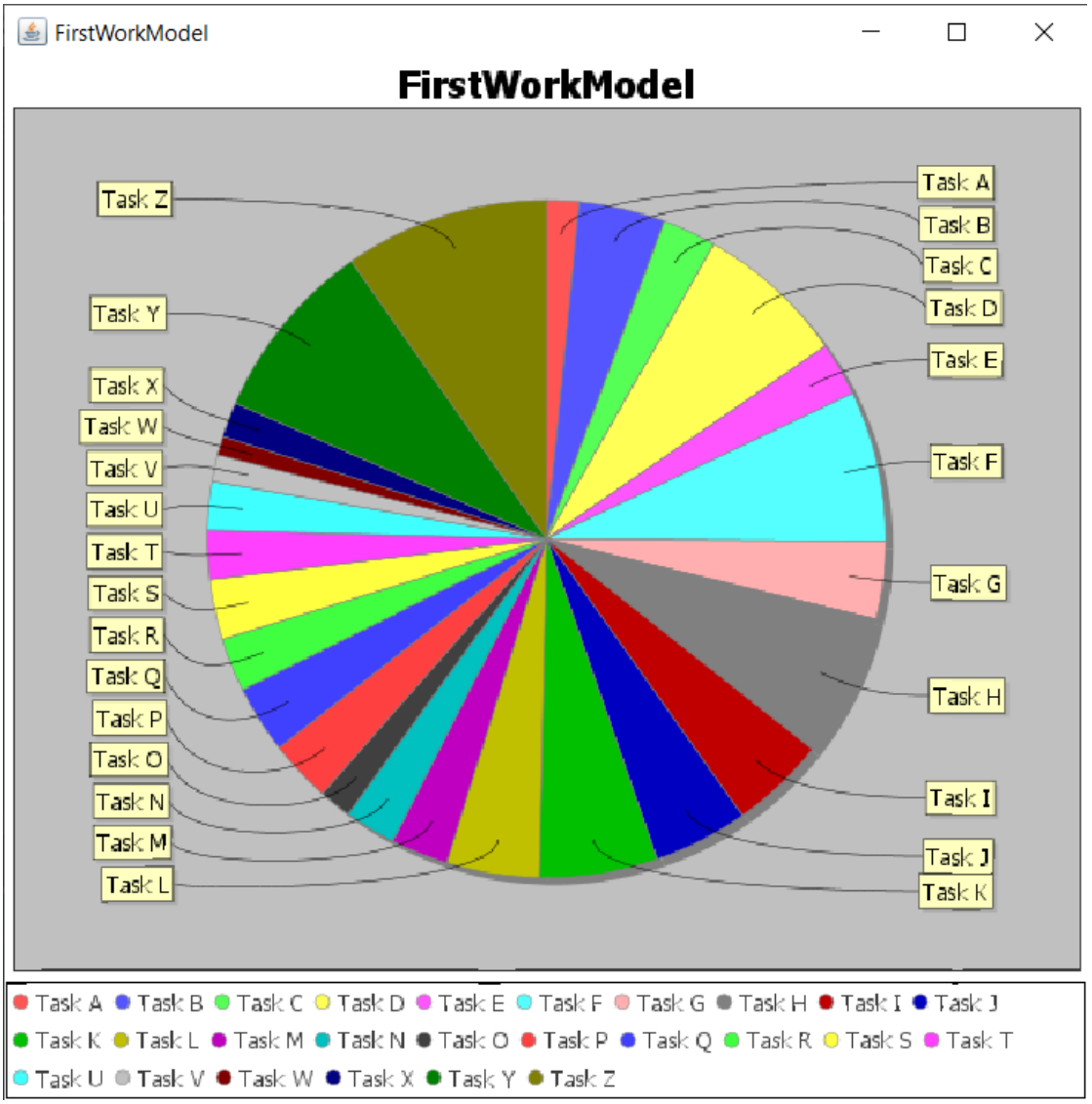


Figure 1.2.

There are 26 tasks in this WorkModel, Task A through Task Z. These are just samples, or placeholders, for real task names but we can imagine what some of these tasks might be, in practice. Some of these tasks would be general ones that are performed in all or most of the wards. Some would be more specific to the particular illnesses that are cared for in specialist wards. Here are just a few examples of tasks that could exist together in a WorkModel, like the one above:

- Administering antibiotics
- Checking vital signs

- Post-op wound care
- Personal hygiene
- Blood transfusion
- Weighing a patient
- Medication education
- Taking blood samples
- Feeding a patient

No patient would need work recorded for all of these tasks during their stay. Any one patient in the hospital will only require a small subset of all of the tasks. Patients in any one ward generally have the same tasks performed for them.

So, from this parent WorkModel, we create a WorkSubModel for each ward in the hospital. The WorkSubModel for the kidney translate ward will contain all the tasks which are performed on patients with kidney failure who are receiving donor kidneys. The WorkSubModel for the surgical ward will contain all of the tasks which are performed on patients who are having surgery.

Then, when a nurse on Ward A is finishing their work shift, they open each patient's WorkSubModel. For patient 1, they select each task on the WorkSubModel, and they select whichever band best describes the amount of work this patient required for this task. They log work for each task for patient 1. Then, they log each task for patient 2, then patient 3, etc.

Configuration and personalization of WorkModels and SubModels:
Our app allows users to personalize the configuration of the WorkModels and WorkSubModels to suit their own liking. We understand that there is no such thing as “one size fits all” and each hospital has their own unique agenda and workflow. We allow our users to build their own WorkModel with whatever tasks they believe deserve a place in it. This gives the user flexibility to decide what tasks should or should not be included.

For example, one hospital that uses our application may consider task X to be deserving of one slice on the WorkModel. However, another hospital may consider task X to be really made up of two smaller tasks, task Y and task Z, so they may wish to represent these as individual tasks on two separate slices of the WorkModel.

Users also can configure how much weight each task should hold in the WorkModel. The amount of work that goes into one task is subject to differences between different hospitals. So, our users can enter the appropriate weight for each task based on their own experience and based on the individual set up of their own hospital.

For example, one hospital may consider task X to be twice as much work as task Y, but in another hospital task X may be three times the size of task Y. Each hospital can input the weights that best match their own individual environment so that the recording of work will be accurate for them.

Users can personally configure how many bands each task is split up into, and can configure the individual weight of each band.

Finally, users can personally configure which tasks form the parent WorkModel go into each of the WorkModels.

Prerequisites:
In order to benefit from this application, it is required that users first perform a Time and Motion study within their hospital. By observing the amount of time and effort nurses put into different tasks for different patients, a general idea can be determined for how much work goes into each task performed. This would be the average time it takes for an average nurse to perform this task on the average patient. The standards for every task performed on patients in any ward in the entire hospital are then compared and converted into ratios with respect to each other's ratio in the entire WorkModel. This provides the standard against which we can compare tasks that are dissimilar.

0.2.1 Work Model

0.2.1.1 Work Model

A WorkModel is the illustration our application uses to display each of the tasks that are performed on patients across the entire hospital in a way that easily shows the user how much work is required, on average, for each of the tasks. Although one task may be performed with minimal effort in just a minute or 2 for some patient X, the same tasks may require more effort and a lot more time for some other patient Y. The depiction of the tasks on the WorkModel represent a standard or average amount of work per task. The bands for each task will then allow for the specification of whether some task was easier than usual to perform, harder than usual or somewhere in the middle. We will explain the bands later on.

The app uses a WorkModel to represent the tasks to the users. A WorkModel is a way of representing the amount of work required, on average, for each of the tasks that go on in the hospital. The WorkModel looks similar to a pie chart, but it is important to note the difference: a pie chart represents a collection of data but a WorkModel is simply a way of laying out each task alongside each other in a way that shows the average difference in work required for each of the tasks.

The tasks that the WorkModel contains are configured by the user. The user enters the tasks they want displayed on the model. This means that each hospital that uses our application gets their own personalised WorkModels that suit their particular needs. This means that while one hospital using our system may like to track the work done for some tasks T, U, and V, which may all be tasks performed in sequence of each other, another hospital may

The app displays tasks on a model that looks similar to a pie chart. We call this a WorkModel. It is important to note that this WorkModel is not a pie chart, it just looks like one. A pie chart represents a bunch of data. Our Work Models are simply a sequence of buttons laid out in a model that is shaped similar to a pie chart. The figure below is an example of what your WorkModel may look like.

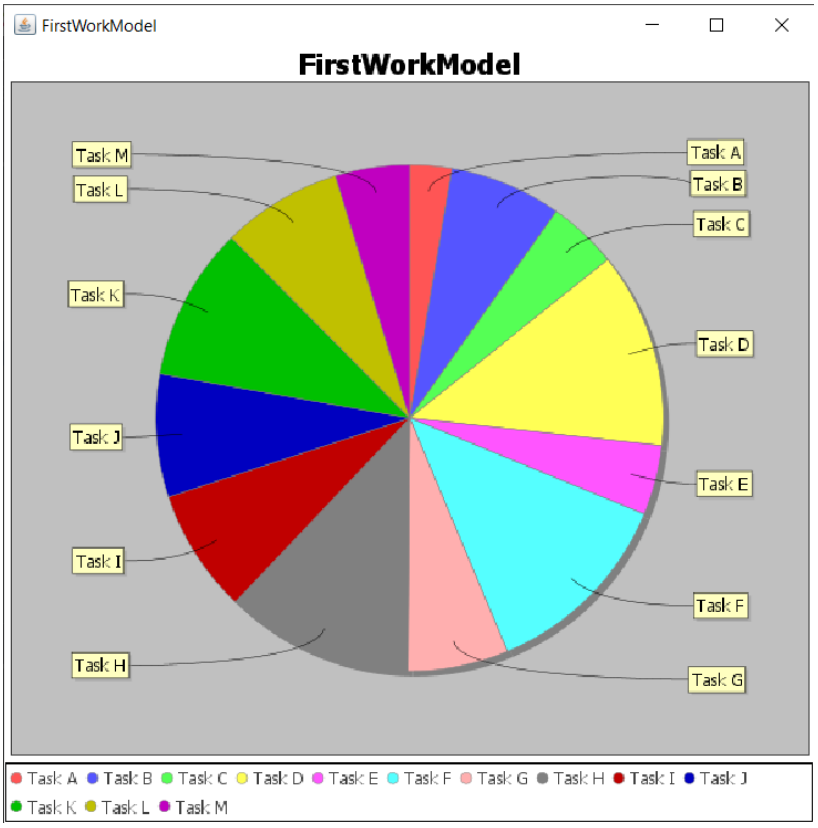


Figure 2.1.

The figures that determine exactly how much work is involved in a task are not displayed here. The user interface is designed to be more relatable to humans, who do not put a figure on exactly how much work is involved in each task. The back-end of the application deals with the numbers and figures. The front end displays the tasks in a way that is intuitive to the users.

0.2.1.2 Work Model Tasks

The tasks on a WorkModel are represented by slices on the wheel. The size of the slice indicates how much work is required for this task with respect to how much work is required for all other tasks in the model.

The example WorkModel has been configured to contain 13 tasks, Task A through Task M. Each slice on the WorkModel represents one task.

0.2.1.3 Work Model Task Ratios

The size of the slice represents the amount of work required for that task in relation to all other tasks in the Work Model (all other tasks performed on patients in the whole hospital). As we can tell from the display of this WorkModel, Task A is generally a very small task, which, on average, requires only a small amount of effort. Task F on the other hand is usually quite a large task, which, on average, requires quite a large amount of effort.

0.2.1.4 Work Model Bands

The bands on a WorkModel are the various levels of intensity that one task could be said to have. Essentially, for each task, the user must categorize the levels of intensity on a scale of 1 to 10, with 1 indicating a hypothetical situation where the task was very easy to perform, and 10 indicating a hypothetical situation where the task was the most difficult it could possibly be to perform. The user might say that some task A usually requires 3 levels of effort, a little (maybe 2 out of 10), a fair bit(maybe 6 out of 10), or a lot (10 out of 10). Another task B may only ever present itself requiring two levels of effort, a bit (3 out of 10), or a lot (10 out of 10), with no in between. The benefit of our application is that the user can personalize their system with the task of a weight they deem appropriate, and the levels of intensity inside a task holding weights they deem appropriate.

0.2.1.5 Work Model Band Weights

The weight of each band specifies how much work is required for this task in a certain context. Like our example of washing a patient, in the situation where a patient washes themselves, then the band for 0 work required would be logged for that patient that day.

For example, changing a wound dressing may require a very small amount of effort if it is a small wound and it is almost healed, but it may require a lot of effort if it is a big wound and it is fresh and perhaps the patient is unconscious and perhaps the wound is in an inaccessible place on the patient's body.

Another example is bathing a patient. A patient may be able to wash themselves, therefore 0 effort is required from the nurses, or maybe the patient needs help getting to and from the washroom, then a little effort is required from the nurses. If a patient is unable to move from their bed and unable to wash themselves, perhaps 2 nurses will be required to give them a bed bath, in which case a lot of effort is required.

0.2.2 Sub Model

0.2.2.1 Sub Model

While the WorkModel is a depiction of all the work ever done in any section of the hospital all portrayed alongside each other, the WorkSubModel is a subsection of this big collection of tasks. A hospital creates a WorkSubModel for every ward.

0.2.2.2 Sub Model Tasks

The WorkSubModel will contain only a subset of the tasks from the WorkModel. This will be a subset of tasks which are usually performed alongside each other. We recommend that users create a WorkSubModel for each ward in the hospital. This WorkSubModel will then contain all the tasks that are performed in that ward. This will ensure that users are not distracted by unnecessary tasks being displayed on the user interface.

0.2.2.3 Sub Model Task Ratios

Our app calculates a new pro rata ratio for each task in the subset. This updated task ratio is for display purposes only. If a WorkModel contains 20 tasks, and a WorkSubModel contains just 4 of those tasks, the sizes of those 4 slices need to expand to fill up a whole wheel. They keep their ratios with respect to one another and they fill up the whole wheel. When a user logs work for one of these tasks, the original amount of work form the WorkModel is what is stored.

0.2.2.4 Sub Model Bands

The bands on the WorkSubModel tasks hold the same meaning as the bands for that task in a WorkModel.

0.2.2.5 Sub Model Band Weights

The WorkSubModel Band Weights hold the same meaning as the bands for hat task in a WorkModel. They do not need to be updated or expanded or modified in any way.

0.2.2.6 Sub Model Default Task Band Values

The application allows for configuration of default band values in a WorkSubModel. This is a specification of which level of intensity is generally the most common in the context where this WorkSubModel is used. For example, if in Ward A the task X almost always requires the most effort possible, the user could set the default value for this band on this WorkSubModel to be the band of weight 1, the fullest weight. With this set, our application will log an initial workload for each band when a new patient arrives on a ward. This is to alleviate the problem where patients may not be seen to and have work recorded for them immediately upon entering a ward. These values can always be updated if a patient does not follow the usual pattern of what work they require.

0.2.3 Departments and Wards

0.2.3.1 Dept Work Model

WorkModels are created with a large collection of tasks that are performed inside a hospital, and WorkSubModels are created for areas where a subset of these tasks are often performed together (in practice, this is a ward). We realize that hospitals have divisions on higher levels than just wards, so in our application, each department links to a WorkModel. We expect in most practices, almost all departments will link to the same WorkModel.

You may have a collection of tasks performed in your maternity department that simply never come close to being performed alongside a different collection of tasks in your general hospital department. You may also have a psychiatric department of your hospital where another separate collection of tasks are performed on patients.

To prevent maternity tasks “clogging up” your WorkModel when they could be kept separate, we have allowed for the configuration of more than one WorkModel. You can create as many WorkModels as you like and attach one to each department of your hospital.

0.2.3.2 Ward Sub Model

The wards within each department can be matched with a WorkSubModel that was created from a subset of the tasks in the WorkModel belonging to that department.

0.2.4 Workload Score

0.2.4.1 Patient Workload Score

The workload scores are the main goals of our application. The patient workload score is a score from 0 to 100 representing how much work was required to be done for this patient in this shift, or on this day. A patient who scores 100 would be a patient who needed the utmost help with every task done for them. A patient who scored 0 would be a patient who did not require any work to be done for them
(in practice this is essentially never going to happen).

The user can view a patient's workload score in RealTime (the current work shift), or for some particular shift or some particular day in the past.

0.2.4.2 Ward Workload Score

The ward workload score is a figure representing how much work was required to be done for patients in this ward in this shift, or on this day. It is an average of the workload scores of the patient's occupying the ward.

0.3 Desktop Application Walkthrough

0.3.1 Login

Upon opening the application, you are presented with the Log In page. In the username text field, enter the unique username you have been assigned by an administrator in your organization. In the password field, enter the password you have created to match your username. Click the Log In button.

Our application allows users to be assigned one of two different roles, regular users and administrator users. Users of these roles will have different permission levels when using the application. The role you are assigned will depend on your occupation type within your organization.

If you have administrator user permissions, then upon log in you will be brought to the admin home page where you have 4 buttons to choose from. These buttons are Configuration, Patient WorkLog, Staff List, and Analysis. We recommend assigning administrator user roles to people such as Directors of Nursing, Assistant Directors of Nursing, Clinical Nurse Managers, or anyone in your organization who you wish to have access to these features. Each of these features are explained individually below in sections 3.2, 3.3, 3.4, and 3.5.

If you have regular user permissions, then upon log in you will be brought straight to the Patient WorkLog page. These users will not have access to the Configuration feature, Staff List feature, or Analysis feature. We recommend assigning these user permissions to people such as Registered Nurses, Student Nurses, and perhaps Health Care Assistants, or anyone you wish to have access to logging Patient Workload but who you do not wish to have access to the Configuration feature, Staff List feature, or Analysis feature.

The features of this Patient WorkLog page are explained below in section 3.3.

We will continue to discuss these user roles and their respective permissions levels in section 3.4.

0.3.2 Configuration

Once logged in with an administrator username and once the Configuration button on the Home page has been selected, the user can select one of three options. The first option is to configure a WorkModel. The second option is to configure a WorkSubModel. The third option is to assign departments and ward to their respective WorkModels and WorkSubModels. We will go through what the user can do with each of these selections below..

0.3.2.1 Work Model

When “configure a WorkModel” is selected, some text fields and a table appear on the screen. It will look like the following screenshot.

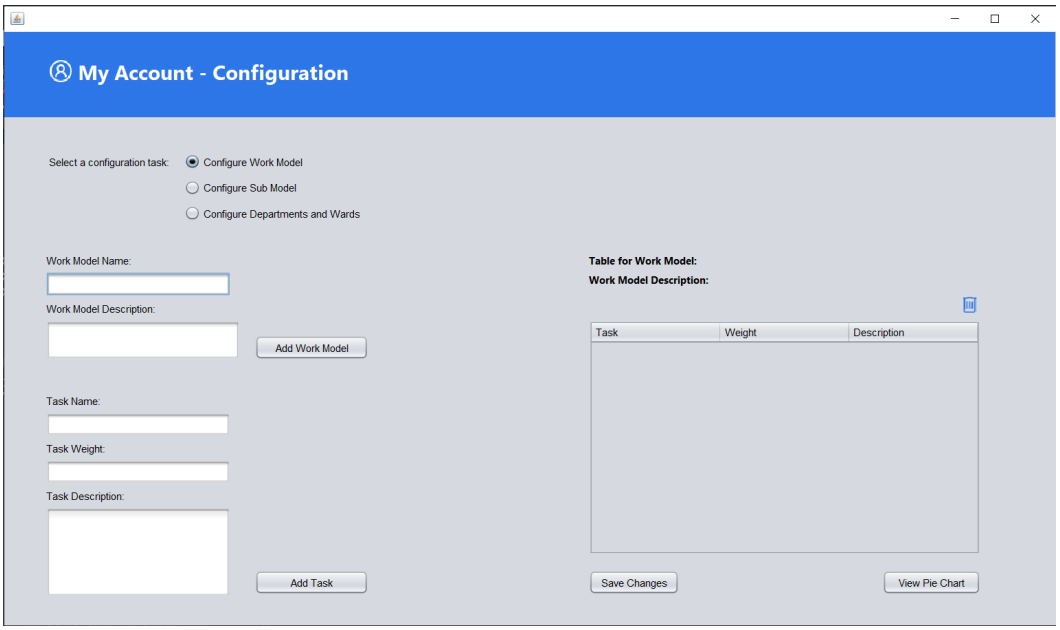


Figure 3.1.

On this page, the user can enter a new WorkModel name in the text field and enter a description for this WorkModel. These fields must be filled in. Upon clicking the “Enter”

button, the new WorkModel name and description will be created and the tasks that will now be entered will be saved to this WorkModel. The name of this new WorkModel will be displayed above the table on the right hand side of the page.

For each task to be entered on the WorkModel, the user can then fill in the three texts fields on the page. The first is a task name. Then a task weight must be entered. This weight is deducted from the Time & Motion study that has to be carried out as a prerequisite to using this application. A description must be entered for the task also. These three fields must all be filled in for each task entered. The application will not accept a task without all three fields being entered.

When a WorkModel name and description are entered, and tasks names and descriptions are entered, the user interface will look something like the following example.

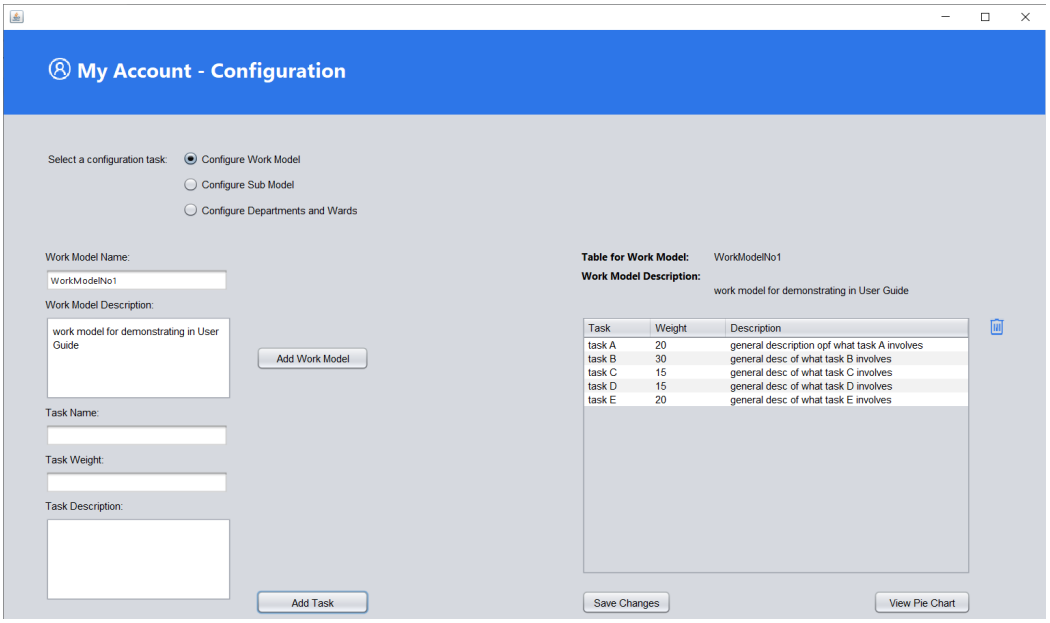


Figure 3.2.

The WorkModel name and description appear above the table on the right hand side of the page. The tasks and their weights and descriptions that have been entered appear in the table on the right hand side of the page.

At this point, the user can select the View WorkModel button to have a window appear on screen showing a sample of what this WorkModel would look like before they decide to save their changes. The screenshot below shows what it would look like for this example.

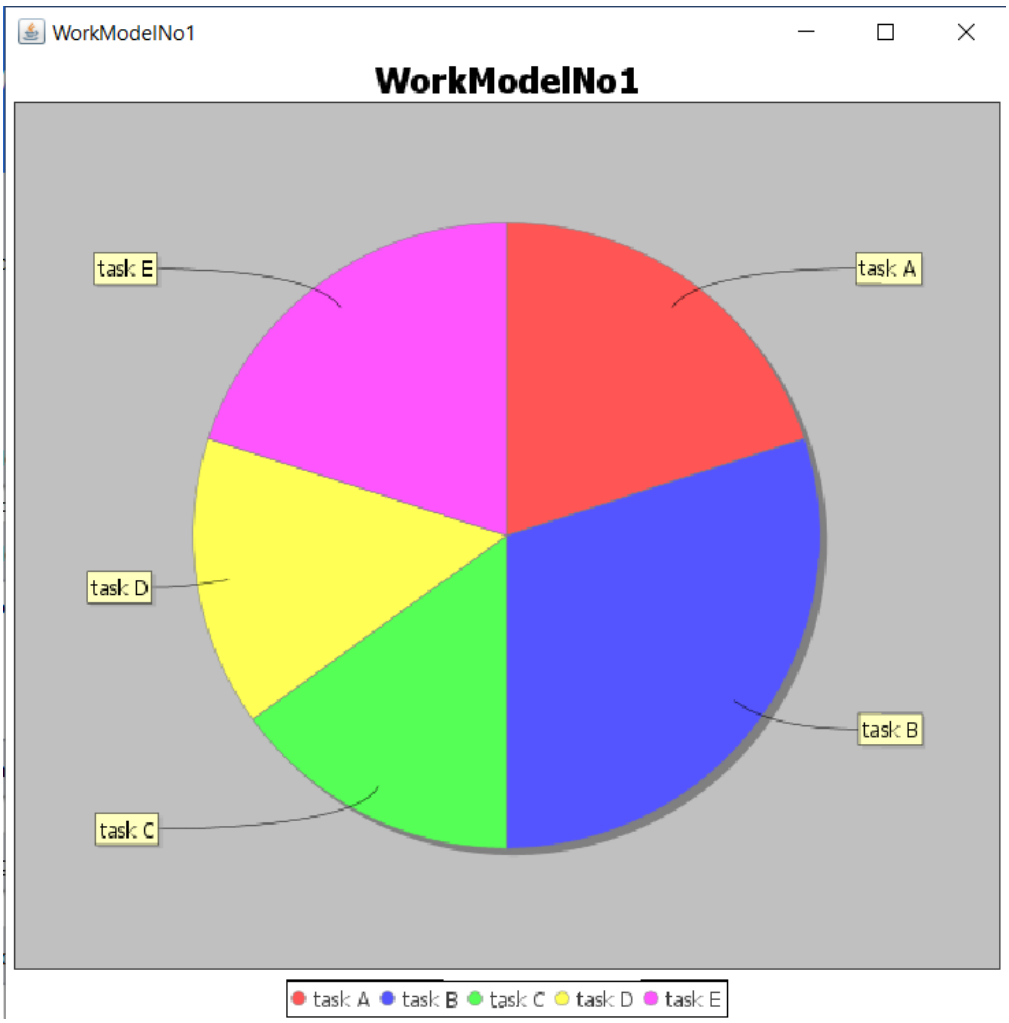


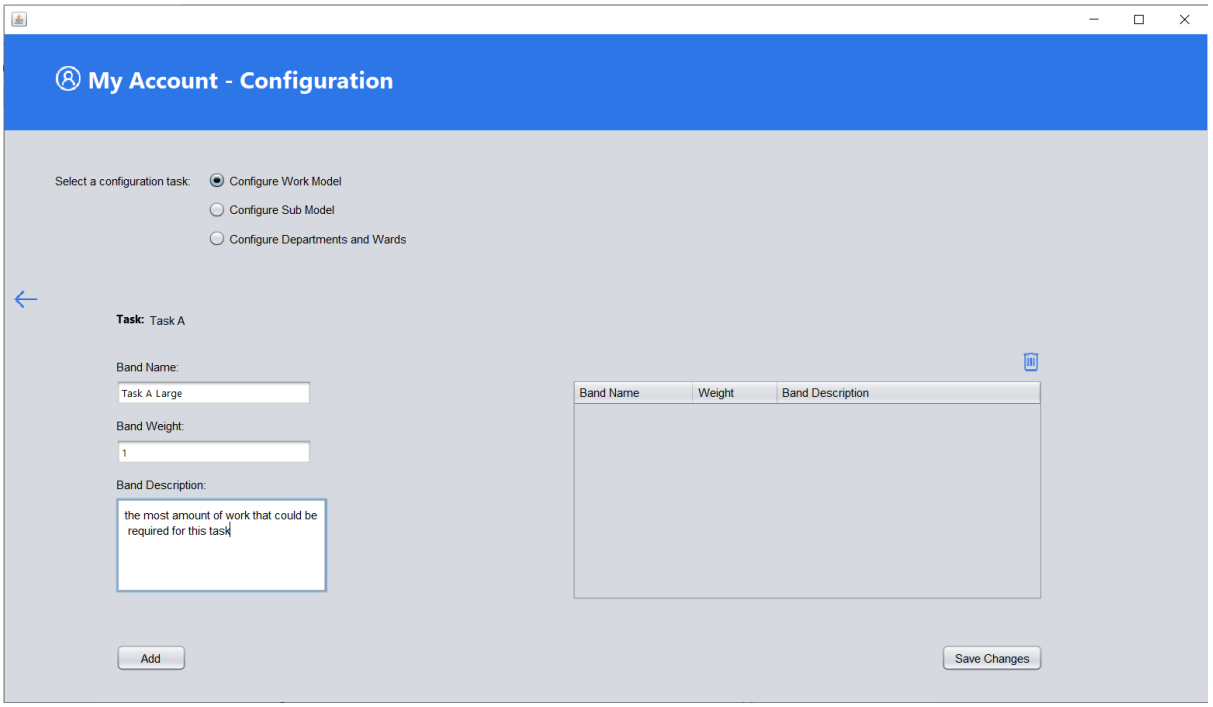
Figure 3.3.

This window shows the tasks the user had entered in the table and what they look like when their slices represent their weight in relation to one another. This sample display is to show the user who is configuring the WorkModel what it will look like to users who are logging work for a patient.

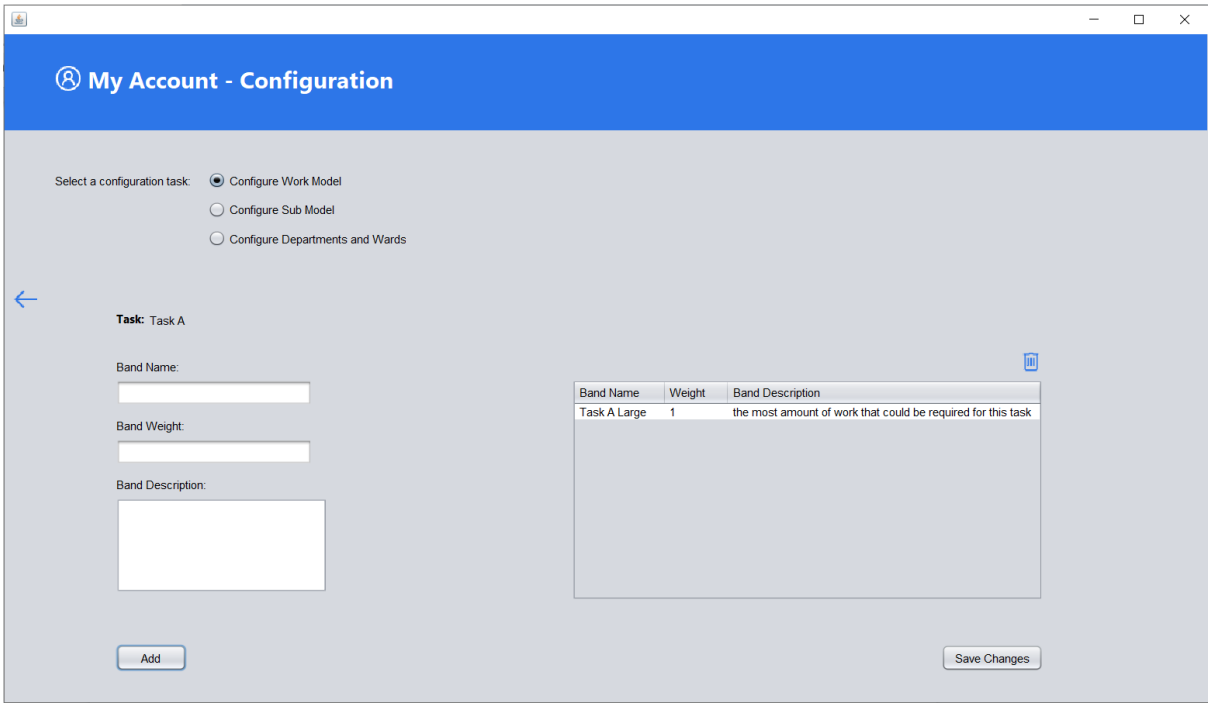
As you can see, the name of the Work Model appears at the top of the window and each task is labeled.

Once the user is happy with the configuration of the WorkModel, they can click the SaveChanges button and their WorkModel configuration will be stored. Note: the sum of the task ratios must equal 100 in order for the WorkModel configuration to be saved.

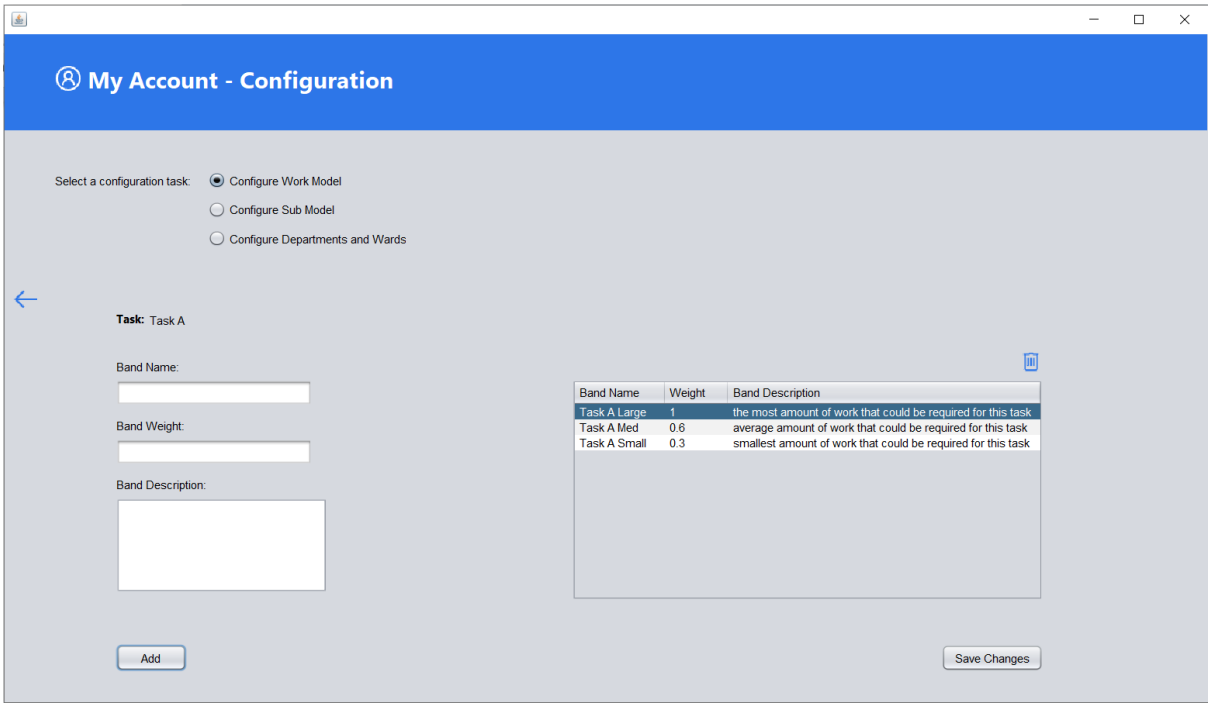
Configuring bands for each of the tasks:
Once the WorkModel has been created and the tasks have been added to it, the user must select each task and configure the bands for that task. For our example, we selected Task A and this is what the page now looks like:



Here we can enter however many bands we wish to exist for Task A. We are entering a band to indicate the most amount of work that could possibly be done for this task. When we select the Add button, this task will appear on the table on the right hand side. It will look like this:



Now we can add more bands.



Now we can select the SaveChanges button. This will save the bands belonging to Task A for the WorkModel we created called FirstWorkModel. Note: no bands of duplicate weights are allowed in order for the configuration to be saved.

In section 3.2.2, we will explain how to use this WorkModel to create WorkSubModels.

0.3.2.2 Sub Model

When “configure a SubModel” is selected, some text fields and two tables appear on the screen. It will look like the following screenshot.

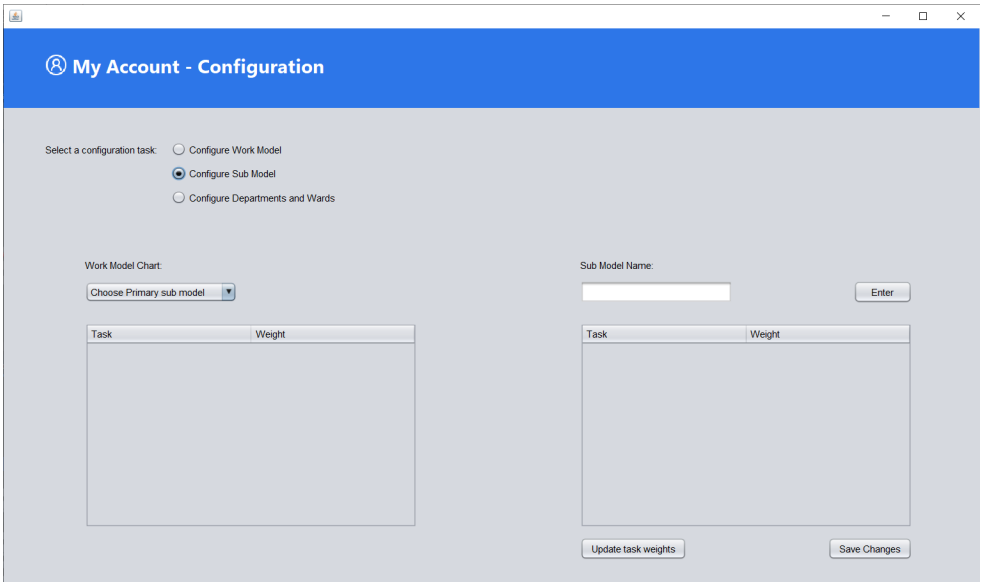


Figure 3.4.

On this page, the user can select a previously created WorkModel from the dropdown menu on the left hand side of the page. Once a WorkModel has been selected, the tasks that belong to that WorkModel appear in the table on the left hand side of the page. In our example, this is what it looks like.

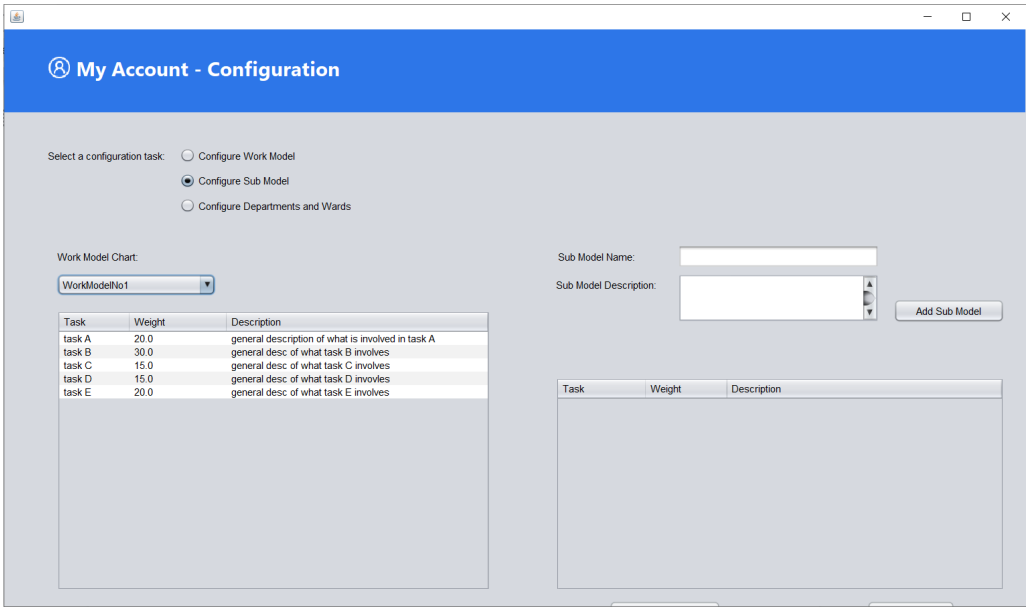


Figure 3.5.

Now the user can enter a WorkSubModel name and description in the text fields on the right and select the Add Sub Model button. When this button is selected, a pop up message will inform the user that their Sub Model has been created and they can now select which tasks from the WorkModel they wish to include in this particular Sub Model. At this stage the page looks like this.

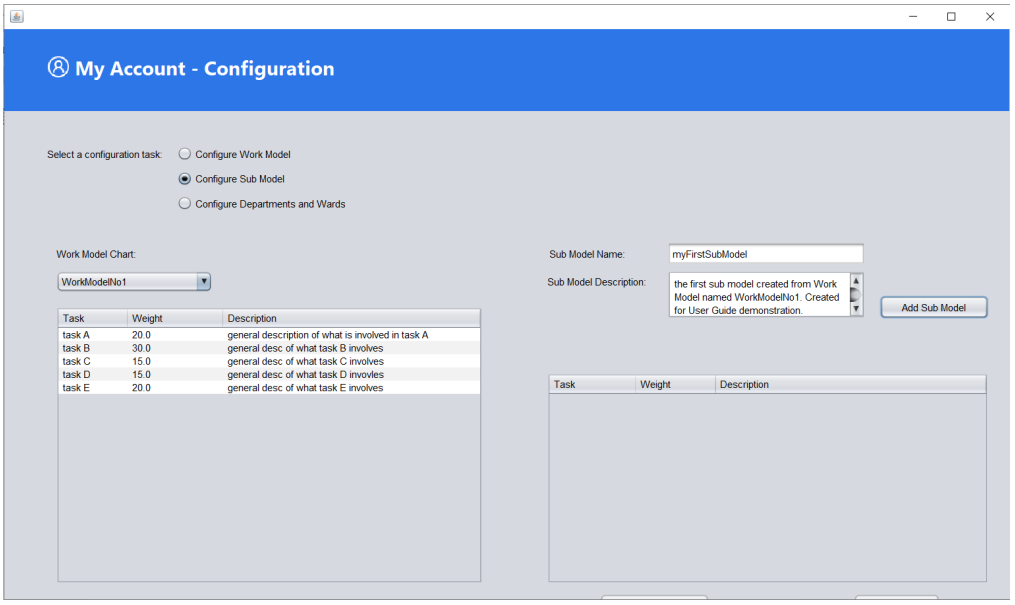


Figure 3.6.

At this stage, the user must select whichever tasks from the WorkModel they wish to include in this WorkSubModel.

Remember that WorkSubModels are to be used to log work done for patients in each individual ward. We recommend creating each WorkSubModel with a particular ward in mind. For our example, we will create a WorkSubModel for a ward A. The tasks the nurses usually perform in ward A are tasks, A, B, and E. Tasks C and D are not usually performed in ward A.

We will select tasks A, B, and E from the WorkModel table on the left hand side and they will appear in our WorkSubModel table on the right hand side. Now our page looks like this.

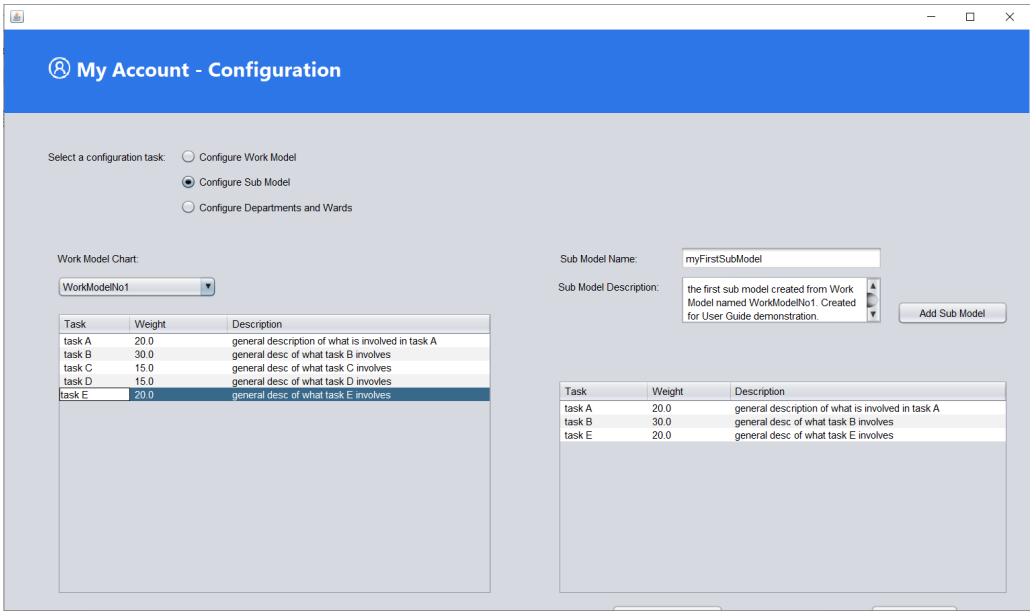


Figure 3.7.

The Preview WorkSubModel button displays a preview of what this WorkSubModel will look like when it is in use for logging work for patients. You may notice a change in the Task Ratios. This is normal. Since the selection of WorkSubModel tasks is just a subset of the WorkModel tasks, their ratios must be redistributed in order for them to fill up the whole wheel of the WorkSubModel.

Now we know our WorkSubModel tasks are ready to be saved. We will click the Save Changes button and a pop up message will inform us that our changes have been saved.

0.3.2.3 Department and Ward - WorkModel and WorkSubModel Assignment

When “configure departments and wards” is selected, this below page is displayed to the user.

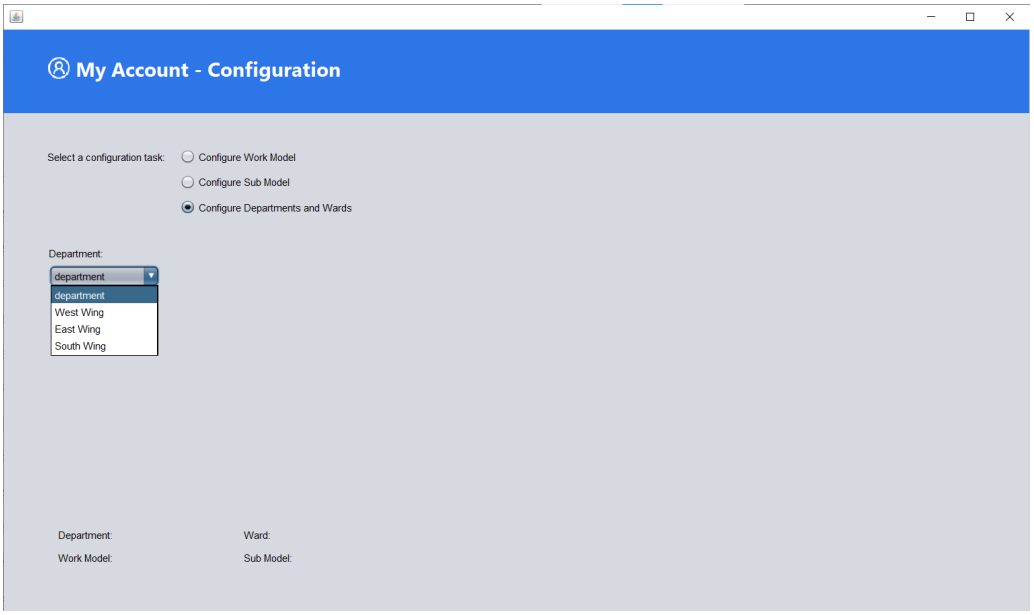


Figure 3.9.

This section of the app is where you link the WorkModel(s) and WorkSubModels you have created to departments and wards in your hospital.

One dropdown menu appears on its own at first. This is a dropdown menu of departments within your hospital. It will look like the following screenshot. Here the user can select which department they wish to assign a WorkModel to.

Note: In practice, we expect that most hospitals will use the same WorkModel for all departments within their hospital. In this context, there would not even be any need for users to create more than one WorkModel. The reason we allow for more than one WorkModel and for each department to be assigned to different WorkModels is because a hospital may have a psychiatric department for example, where the crossover of which tasks are performed on patients in both this psychiatric department and the general hospital would be so small that it would simply be a better idea to make individual WorkModels for each department.

When the user selects a department, they are shown a list of previously created WorkModels. They must select the WorkModel that will be assigned to this department. This means that any wards inside this department can only use the WorkSubModels that have been created out of this WorkModel. In our example, we will see the WorkModel we just created and also some other WorkModels that were previously created. It looks like this:

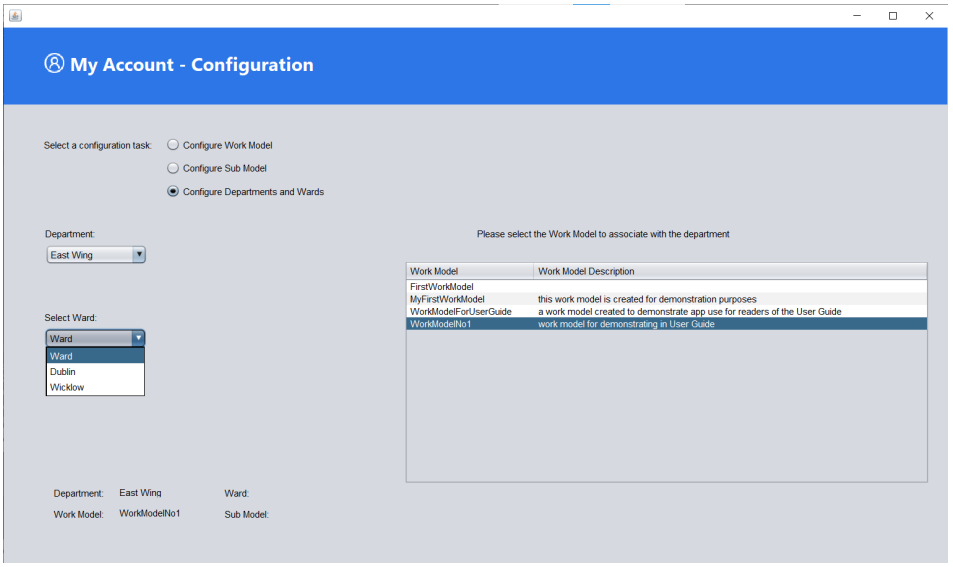


Figure 3.10.

In the above screenshot, we have selected a department from our dropdown list. We have also selected WorkModelNo1 to be assigned to this department. The ward dropdown menu shows us the wards that belong to the chosen department. When we select a ward, we will be shown the WorkSubModels that belong to WorkModelNo1, as WorkModelNo1 is the WorkModel for the East Wing department.

We have selected the Dublin ward. Here is myFirstSubModel, which we created in the previous steps. Another WorkSubModel which was created previously is displayed here too. When we select the WorkSubModel we wish to assign to this ward, the match is made and we are shown the WorkSubModel and its bands. Here we must select what bands we want to configure as the default bands for this WorkSubModel on this ward. The default bands are explained in section 3.2.4

0.3.2.4 Sub Model Default

When we have selected our WorkSubModel to be assigned to the selected ward, the WorkSubModel is displayed to us and we must click on each task in order to set a default band value for this task.

The default band value is automatically entered by the system for every task in the WorkSubModel for a patient as soon as the patient enters onto a ward. This is set up because nurses are often very busy all day long and when new patients arrive, the nurses may not always get around to recording information for them as soon as they would like. So our system will allow the users to configure a default value to represent an educated guess at where on the spectrum of work required for any one task a new patient may reside.

We will use the example of patient hygiene again to explain this. If the types of illnesses cared for in Ward A tend to not affect a patient's ability to wash themselves entirely on their own, then the default band for the task of personal hygiene could be set to 0 (No Work Required). If the types of illnesses cared for in Ward B tend to greatly affect the patient's ability to wash themselves but the patient's can make it to the bathroom on their own, then

the default band for the task of personal hygiene in ward B could be set to 0.3 (or whatever weight you have configured this band to be), of which the band description describes this type of situation, where patients require help washing.

When we are viewing the selected WorkSubModel and we are about to configure the default bands, this is what is displayed to us.

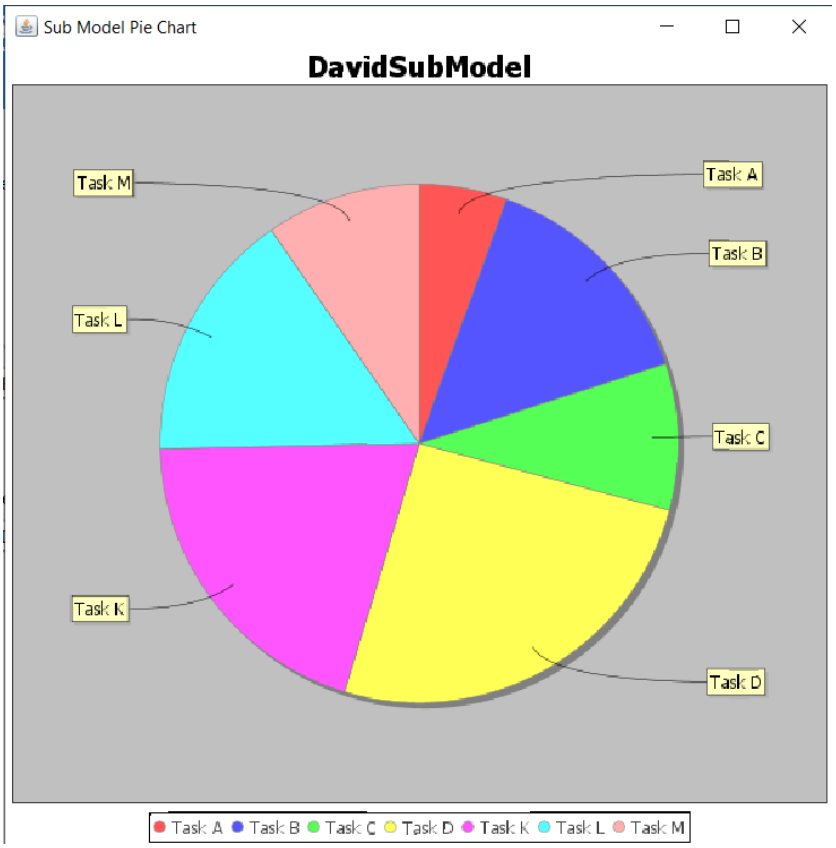


Figure 3.11.

We now select a task and we are displayed the bands for this task. It looks like this.

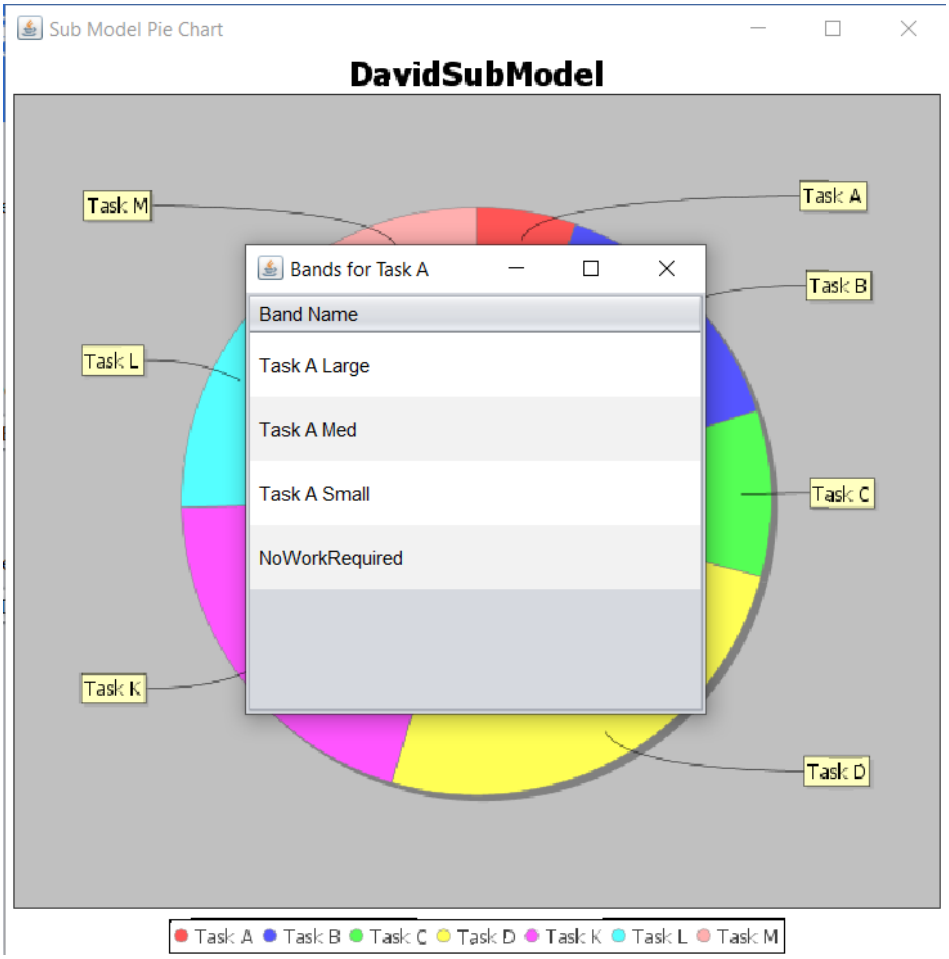


Figure 3.12.

Now I can select the band named whichever band is the best educated guess on how much work a new patient entering this ward may need for this task. The user then selects each task around the WorkSubModel and sets a default band for each of these tasks.

Once all tasks have had a default band selected for them, we can exit the window of the WorkSubModel and select the Save Changes button at the bottom right of the screen. We are now asked to enter a name for the set of Default values. We recommend including the Ward name and the date you created it in the name. The page will look something like this.

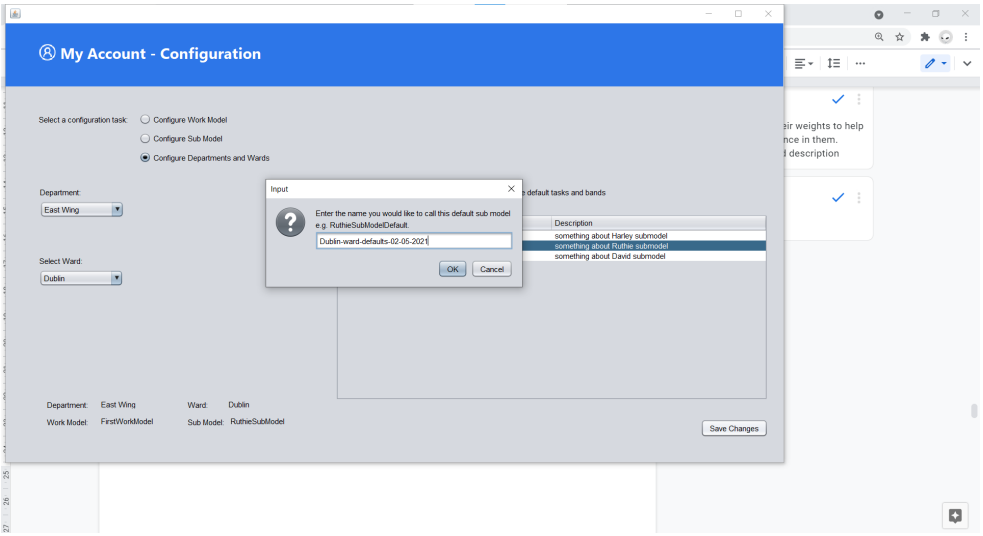


Figure 3.13.

After you save the name, you will be asked to confirm. Confirm your configuration and you now have a WorkModel of tasks in a department of your hospital, you have a WorkSubModel for a ward and you have default values to be entered for every patient that enters the ward !

These default work logs are logged by the system (the Staff_ID logged in the database record is a system Staff_ID which indicates that these logs were done automatically by the system and not by any human user). They can be overwritten by nurses if some patient does not follow the typical trend of initial band values.

0.3.3 Patients - Work Log

When an administrator user clicks the Patients-WorkLog button from the Account Home Page, they are presented with the Patients Work Log page. This is the same page that is displayed to regular users once they log in because it is the only feature they have access to. On this page, we have a dropdown menu of wards to select, we have an empty table which will fill with names of patients in the selected ward. We also have a blank area on the right hand side of the page which will fill with a WorkSubModel when a patient is selected from the table. This is what the page looks like upon first opening it.

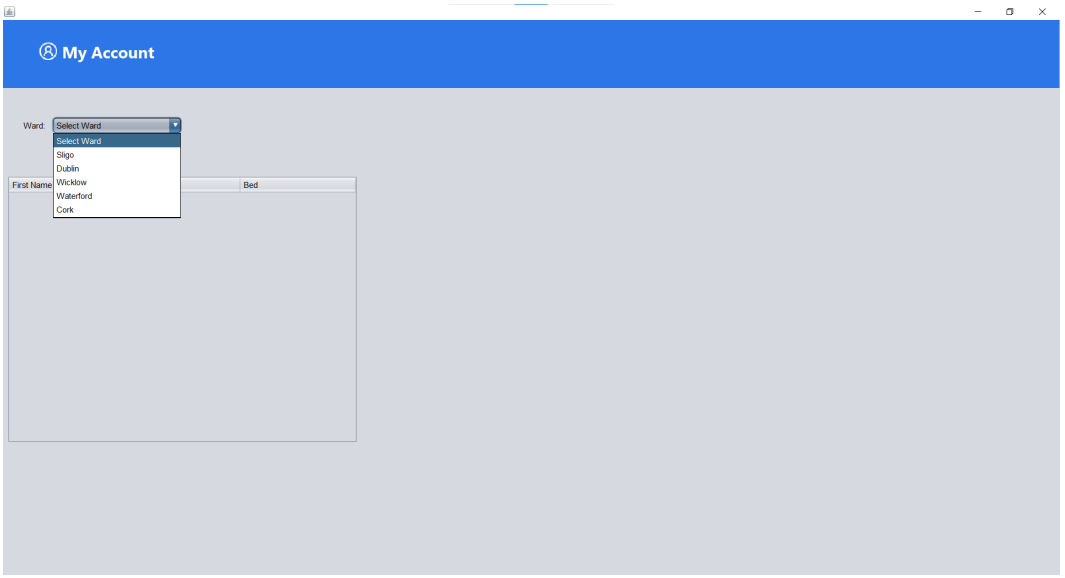


Figure 3.14.

We can select a ward from the drop down menu, we get a table of patients who are currently staying in that ward. When we select a patient, we get shown the WorkSubModel belonging to that ward and we can select a task for this patient and select the amount of work that was required for this patient for this task during this work shift.

For the purpose of this demonstration, we will select task I and record that this task required full force during this shift. When we select the task, this is what we see.

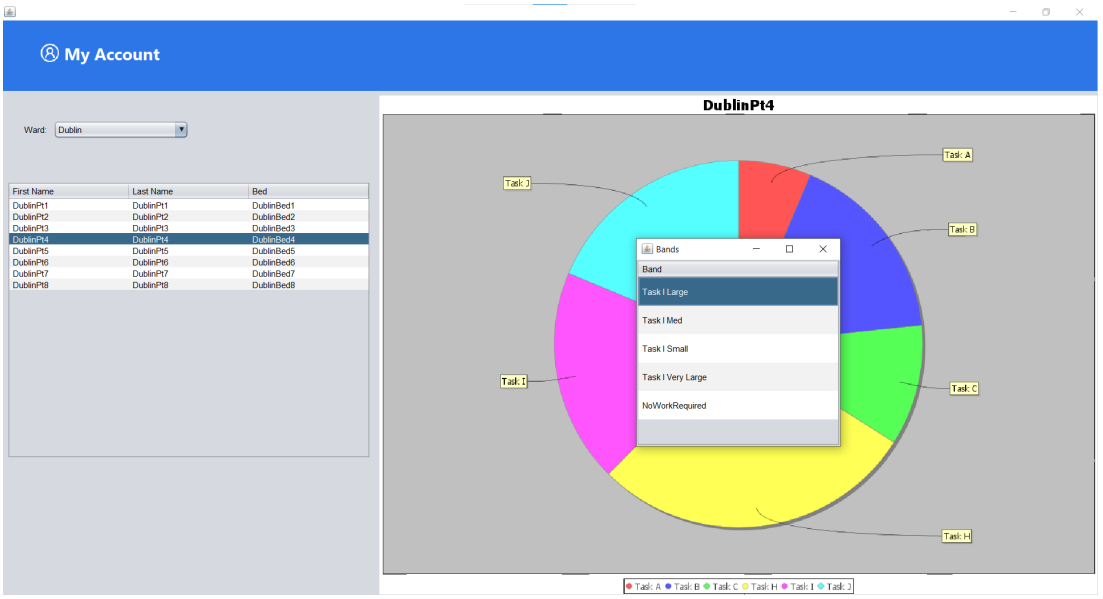


Figure 3.15.

When we select the largest band which indicates that the most amount of work that could possibly be required for this task was required for this patient during this shift. Ie. Large band (weight of 1), we are asked to confirm our selection and then the work has been logged.

0.3.4 Staff List

This page displays a list of all staff members who will be using the application, along with their occupation type, their level of permissions, their unique log in username, and their password which will be hidden behind asterisks symbols (*).

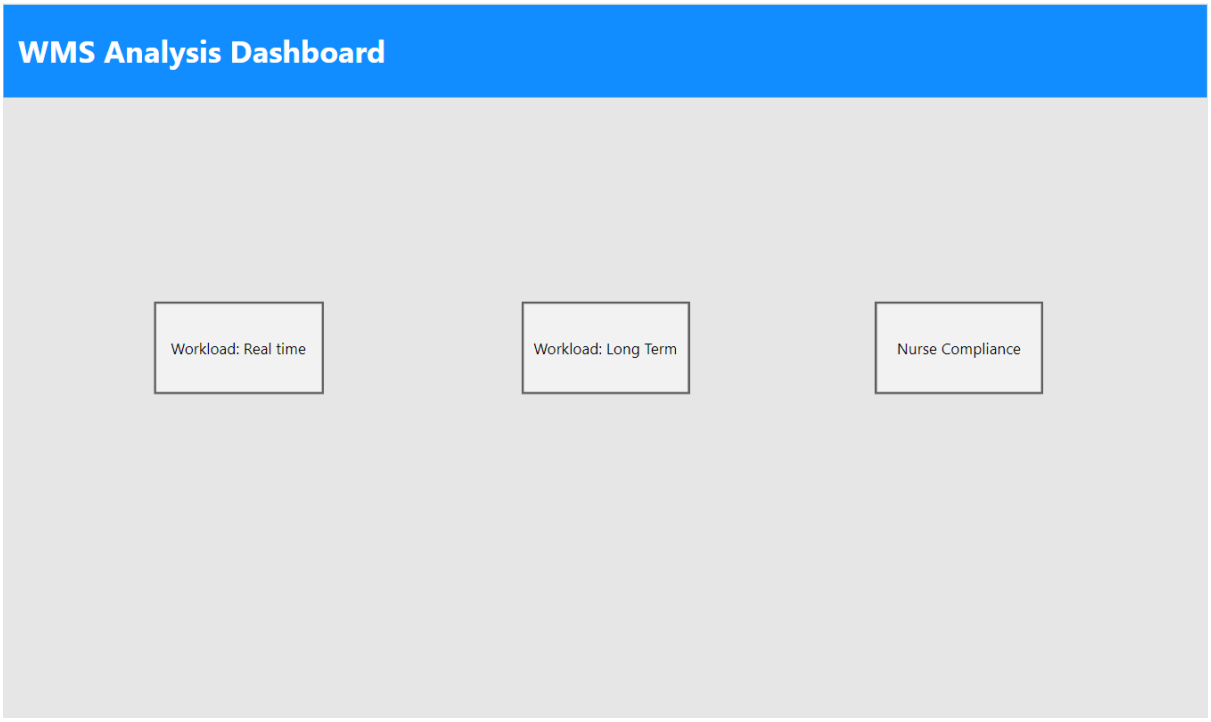
The edit password at the top right allows you to change the password for a nurse. When you select this button, a pop up will appear asking for the username and their old password, and for the new password you wish to create for this user.

0.3.5 Analysis

The analysis section of this system provides an opportunity to visualise the information the application has collected. We can gain many different insights into the workflow of the hospital through the records logged in the Work table alone and through combining the information from the Work table with many other tables in the database.

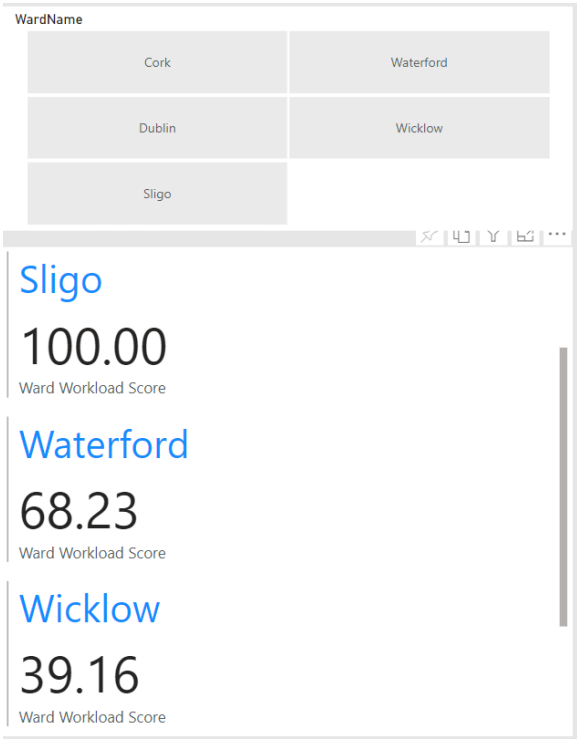
The analysis section can be accessed through the desktop application only. Only staff with managerial permissions can view this. You can view the analysis of your data by selecting the “Analyse Data” button on the account home page. (Figure 3.16.). By selecting this button, you will be directed to the Power BI web page containing the reports related to your workload measurement system.

When the user first accesses the PowerBI report, they are presented with a menu of 3 items: Real Time Data Analysis, Long Term Data Analysis, and Staff Compliance Analysis. You can select an item to view that type of data. The menu look slike this:



0.3.5.1 Real Time Data Analysis

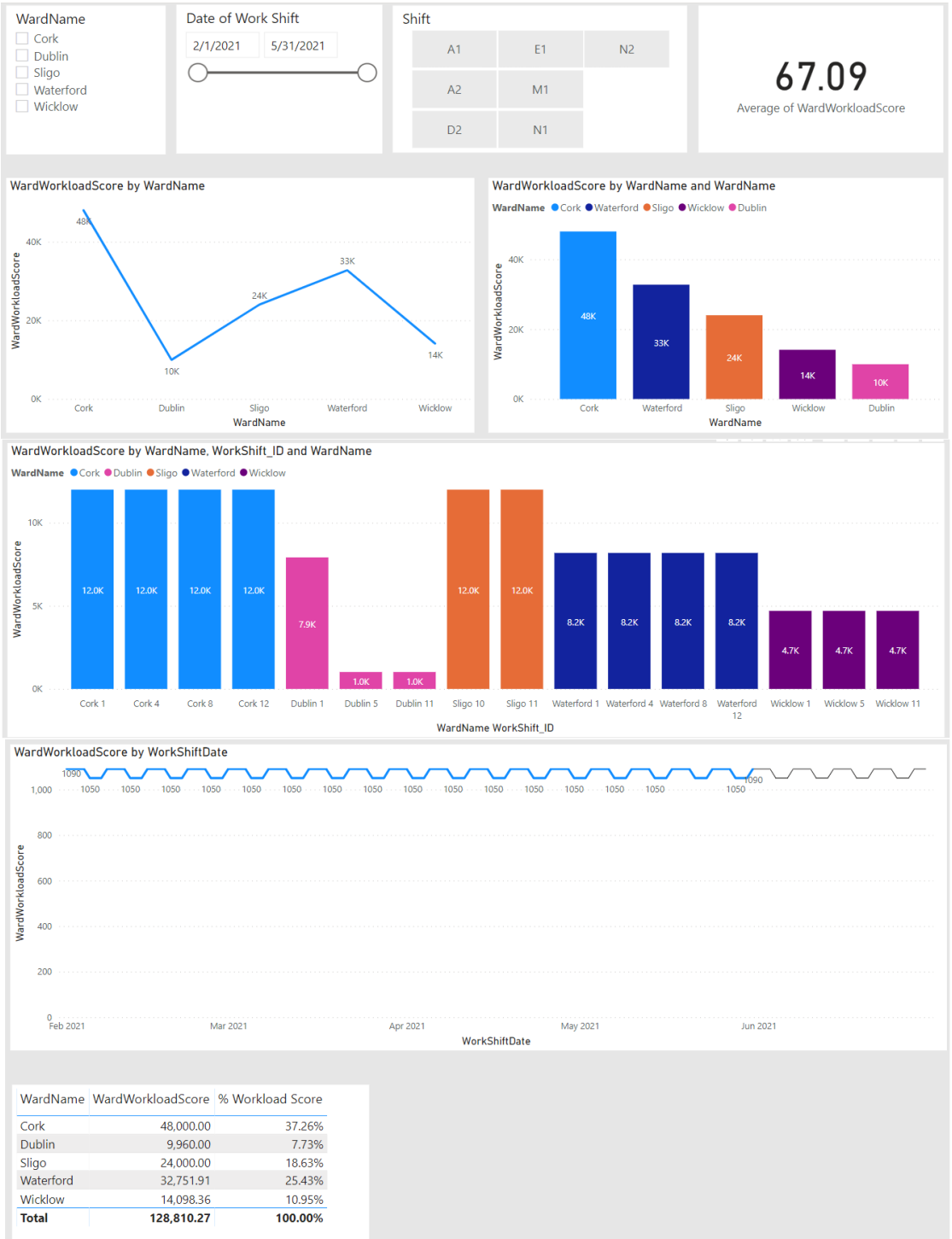
This page presents the user with a table of real time workscore of every patient in every ward. This means it shows each patient's workload score for the current work shift. It also shows a box which gives the workload for each ward. There is a filter on the page to select just one ward and it filters both the table and the ward workload box to display only the information for the selected ward.



Ward	Bed	Sub Model Workload Score	Ward Workload Score
Cork	CorkBed1	100.00	100.00
Cork	CorkBed2	100.00	100.00
Dublin	DublinBed1	0.00	0.00
Dublin	DublinBed2	0.00	0.00
Dublin	DublinBed3	0.00	0.00
Dublin	DublinBed4	0.00	0.00
Dublin	DublinBed5	0.00	0.00
Dublin	DublinBed6	0.00	0.00
Dublin	DublinBed7	0.00	0.00
Dublin	DublinBed8	0.00	0.00
Sligo	SligoBed1	200.00	100.00
Sligo	SligoBed2	200.00	100.00
Sligo	SligoBed3	200.00	100.00
Sligo	SligoBed4	200.00	100.00
Sligo	SligoBed5	200.00	100.00
Sligo	SligoBed6	200.00	100.00
Sligo	SligoBed7	200.00	100.00
Sligo	SligoBed8	200.00	100.00
Waterford	WaterfordBed1	68.23	68.23
Waterford	WaterfordBed2	68.23	68.23
Waterford	WaterfordBed3	68.23	68.23
Waterford	WaterfordBed4	68.23	68.23
Wicklow	WicklowBed1	78.32	39.16
Wicklow	WicklowBed2	78.32	39.16
Wicklow	WicklowBed3	78.32	39.16
Wicklow	WicklowBed4	78.32	39.16

0.3.5.2 Long Term Data Analysis

The Long Term Data Analysis page has 5 data visualizations to give insight to the user about all of the work that has been ongoing in the hospital over a long period of time.



WardName	WardWorkloadScore	% Workload Score
Cork	48,000.00	37.26%
Dublin	9,960.00	7.73%
Sligo	24,000.00	18.63%
Waterford	32,751.91	25.43%
Wicklow	14,098.36	10.95%
Total	**128,810.27**	**100.00%**

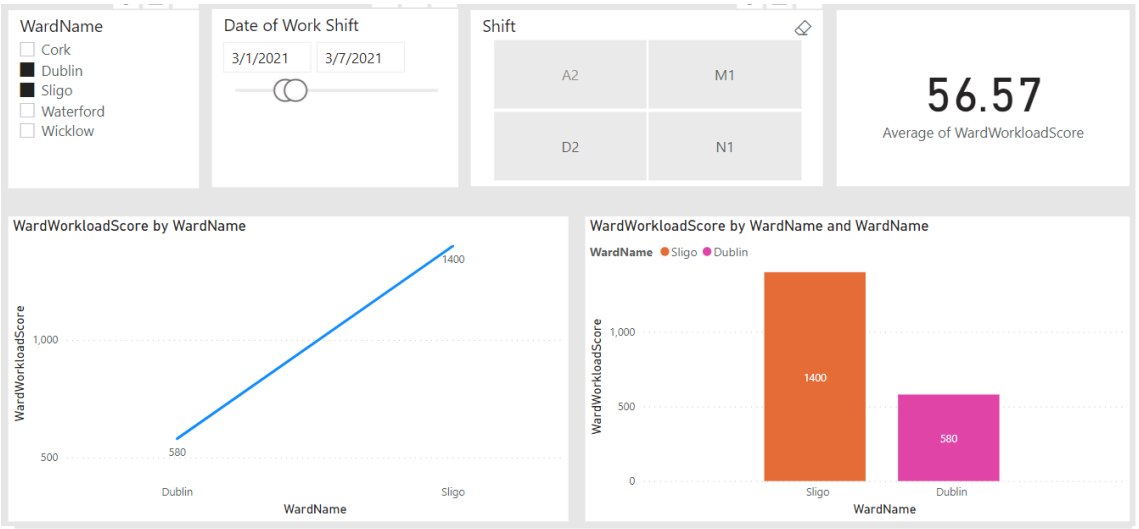
The graphs need to be filtered to provide meaningful information.
The top 2 graphs show the workload scores of each ward. There is a line graph and a bar chart for whichever graph type the user prefers to read. Without any filters, they show, for each ward, the sum of all the workload scores from every shift that there is data for into columns, as some users may prefer.

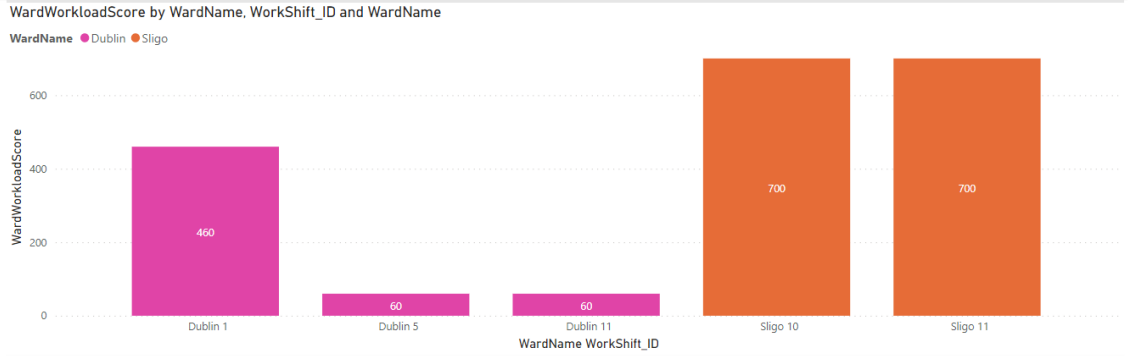
The next chart on the page is a clustered bar chart which shows the workload score for each shift in each ward. Again, unfiltered the first column for example, shows the accumulation of all workload scores for every work shift of ID = 1 in the Cork ward.

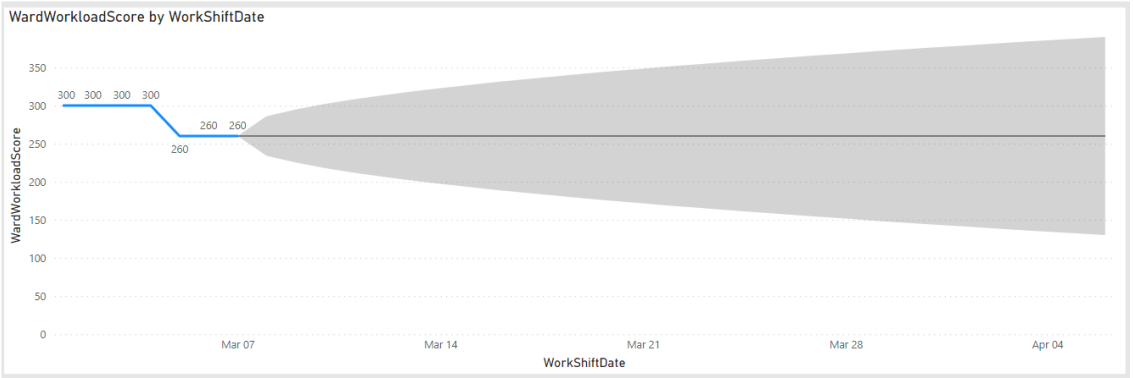
The next line graph shows the workload of the entire hospital (all wards combined) over a period of months. It also predicts what the workload will be for the future months.

The final table shows each ward's percentage contribution to the workload of the entire hospital.

Now we will filter the graphs to gain more insight into the data.





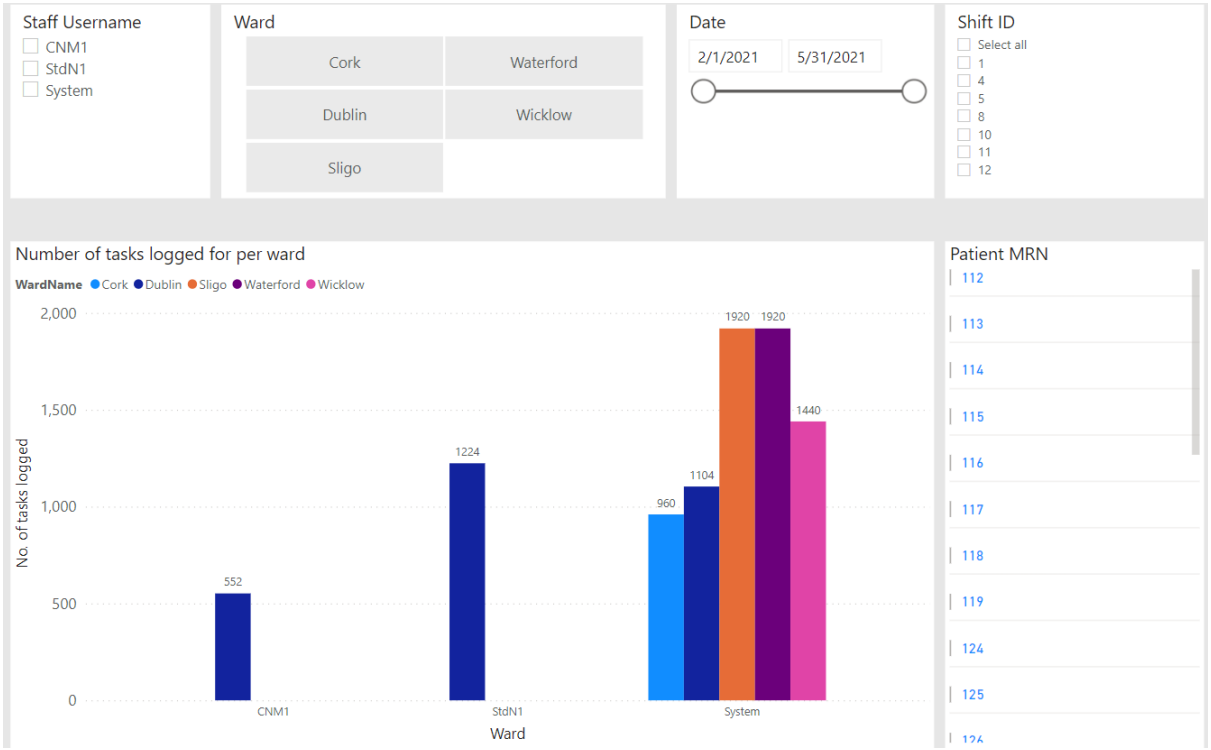


WardName	WardWorkloadScore	% Workload Score
Dublin	580.00	29.29%
Sligo	1,400.00	70.71%
Total	**1,980.00**	**100.00%**

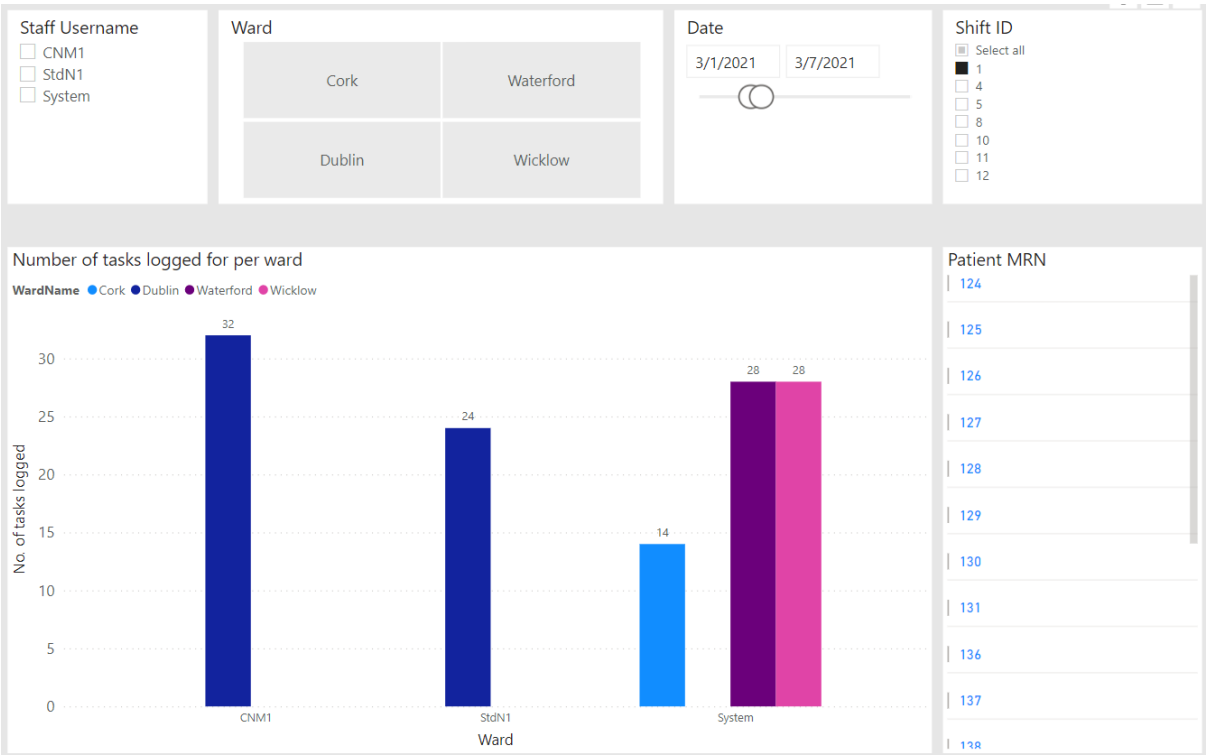
We filtered the data to only show the Dublin and Sligo wards for a period of one week at the start of March. From the top two graphs we can see that the Sligo ward was much busier than the Dublin ward over the whole period.
The middle graph helps us dive deeper into this. We can see that the Dublin wards were pretty busy for one shift out of every day but the other two shifts of the day were very quiet. Meanwhile, Sligo was very busy for both shifts each day.
The line graph with prediction shows us the workload of both wards accumulated for the week. We can see that the first 4 days were very busy, and the final 3 days of the week got a little quieter. The prediction forecasts the workload to remain at 260 for the coming weeks, although it loses confidence incrementally as time goes by (the grey area gets larger).
The bottom table shows us that out of these two wards together, the Sligo ward made up for 70% of the work done, and Dublin made up for just 30%.

0.3.5.3 Staff Compliance Analysis

The Staff Compliance page, shows us how many work records each staff member is logging. This helps us to see which nurses are complying with the use of the application in the hospital. With an unfiltered graph, we can see how many records each staff member has logged over the period of time for which we have data, and also in which wards they logged the work.



In our example, the system has automatically logged work for most of the patients in the hospital. A clinical nurse manager, CNM1, and a student nurse, StdN1 have logged a couple of tasks in the Dublin ward each. We can see that StdN1 has logged more tasks than CNM1. We will filter the data to see if we can learn anything more.



We have filtered the data to show us just the first week of March again, and we also have filtered it to only show the logs from the work shift of ID = 1. We can see here that CNM1 logged 32 records in the Dublin ward that week during the specified work shift, StdN1 logged 24 records also in the Dublin ward. The System user logged 14 records in Cork, and 28 records in both Wicklow and Waterford.

0.4 Mobile Application Walkthrough

The “Lite” version of this system is the task-logging mobile application. The mobile application is available to log patient tasks only. It can be accessed and used by all nurse staff types provided they enter their username and password correctly. By having the option to log tasks on a mobile phone or tablet, we hope that it encourages nurses’ full participation and, furthermore, gives rise to better results for the hospital at hand.

0.4.1 Login

When the mobile application is opened, you are presented with a login page. Similarly to the desktop application, this is where you are expected to provide a valid username and password provided to you for use of the system. If you enter the incorrect password or username the application will notify you accordingly. Figure 4.1. represents the login page for the user.

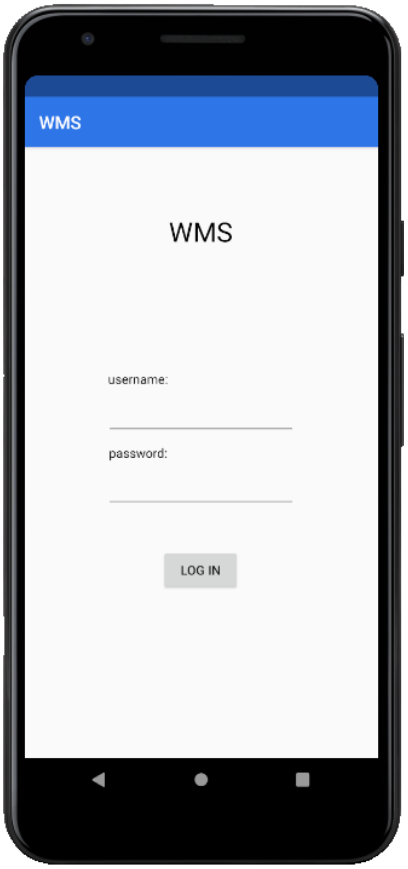


Figure 4.1.

0.4.2 Work Log

0.4.2.1 Ward Selection

Once you have been granted permission/access to the application, you are presented with Figure 4.2. You are prompted to select a ward from the drop down menu Figure 4.3.

Figure 4.2.

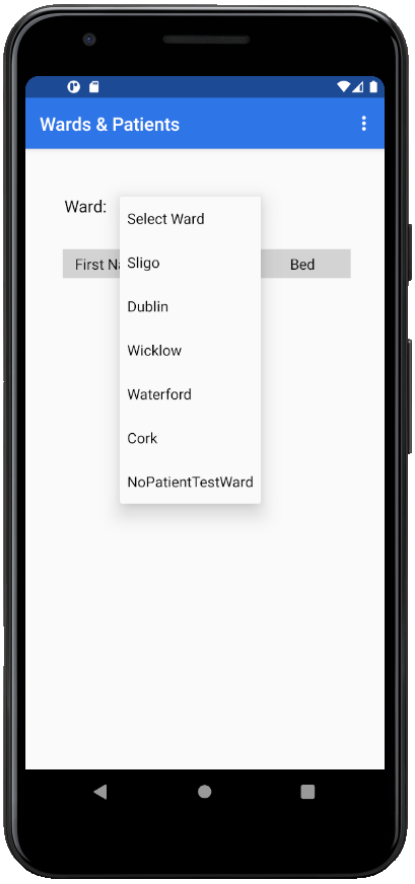


Figure 4.3.

0.4.2.2 Patient Display

Once a ward name is selected from the drop down menu, all patients currently on that ward will be displayed to the user (Figure 4.4.). The patient information displayed include the patients' first name, last name, and bed name. The patient whose task you wish to log should exist in this table. Once selected you should be directed to the selected patient's pie chart.

Figure 4.4.

0.4.2.3 Log Work

Logging work consists of two steps; selecting a task and an appropriate band for that task. A pie chart is displayed (Figure 4.5.) representing each task necessary for your chosen patient. Once the task you wish to log is selected, the application displays the bands associated with that task (Figure 4.6.). A band must be selected to successfully log a patient's workload. Once a task band is clicked the application will display a success message that the task and band have been logged for that patient. You will then be directed back to that patient's pie chart (Figure 4.5.).

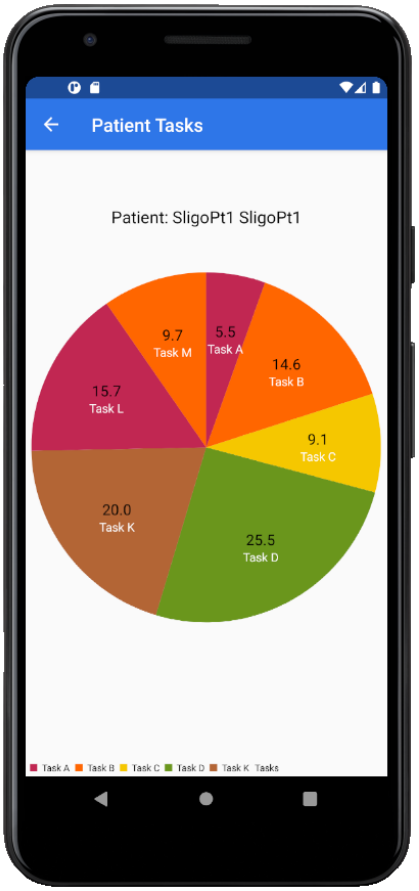


Figure 4.5.

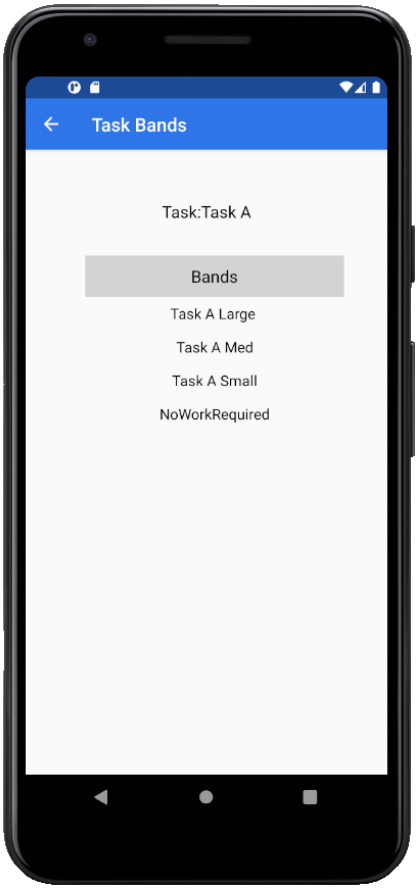


Figure 4.6.

0.4.2.4 Logout

You can log out of your account by selecting the menu icon represented by three dots and situated at the top right of the mobile action bar (Figure 4.7.). Once this menu is clicked, it displays the “Logout” item in the list (Figure 4.8.). Select this item and confirm you wish to log out by selecting “Yes” when a confirm dialog is displayed to you by the application (Figure 4.9.).

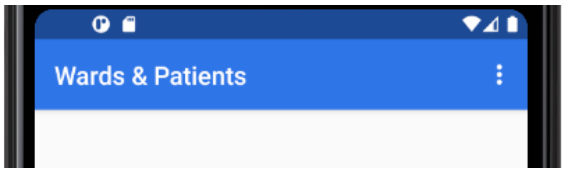


Figure 4.7.

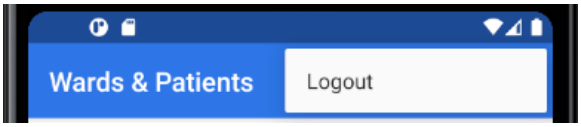


Figure 4.8.

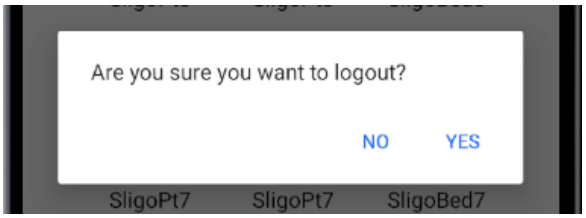

Are you sure you want to logout?
NO
YES
SligoPt7
SligoPt7
SligoBed7

Figure 4.9.