

# Package ‘CaPO4Sim’

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**Type** Package

**Title** A Virtual Patient Simulator in the Context of Calcium and Phosphate Homeostasis

**Version** 0.2.1

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**Description** Explore calcium (Ca) and phosphate (Pi) homeostasis with two novel 'Shiny' apps, building upon on a previously published mathematical model written in C, to ensure efficient computations. The underlying model is accessible here <<https://pubmed.ncbi.nlm.nih.gov/28747359/>>. The first application explores the fundamentals of Ca-Pi homeostasis, while the second provides interactive case studies for in-depth exploration of the topic, thereby seeking to foster student engagement and an integrative understanding of Ca-Pi regulation.

**Imports** shiny, shinyjs, shinyWidgets, shinyjqui, plotly, rintrojs, shinycssloaders, visNetwork, purrr, DT, magrittr, utils

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|                |   |
|----------------|---|
| arrow_lighting | <i>Highlight arrows for steady state events</i> |
|----------------|---|

---

**Description**

Use inside in the [networkCaPO4](#). Nothing is returned except that the network is updated via [vis-NetworkProxy](#).

**Usage**

```
arrow_lighting(edges, simulation, counter, session)
```

**Arguments**

|            |  |
|------------|--|
| edges      | A dataframe of edges provided by <a href="#">generate_edges</a> .  |
| simulation | Which disease is currently selected. See <a href="#">extract_running_sim</a> .                                       |
| counter    | To determine which notification to display. We expect a counter returned by the <a href="#">networkCaPO4</a> module. |
| session    | Session object.  |

---

|          |                 |
|----------|-----------------|
| CaPO4Sim | <i>CaPO4Sim</i> |
|----------|-----------------|

---

**Description**

Explore calcium (Ca) and phosphate (Pi) homeostasis with two novel 'Shiny' apps, building upon on a previously published mathematical model written in C, to ensure efficient computations. The underlying model is accessible here <<https://www.ncbi.nlm.nih.gov/pubmed/28747359>>. The first application explores the fundamentals of Ca-Pi homeostasis, while the second provides interactive case studies for in-depth exploration of the topic, thereby seeking to foster student engagement and an integrative understanding of Ca-Pi regulation. These applications are hosted at <<https://rinterface.com/AppsPhysiol.html>>.

**Author(s)**

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- Kidney NCCR.CH [funder]
- The Interface Group (Hosting Group) [copyright holder]
- RinteRface (R/HTML Templates) [copyright holder]

---

diseaseCheckBox      *Create a checkbox for [diseaseSelectUi](#)*

---

### Description

Create a [prettyCheckbox](#).

### Usage

```
diseaseCheckBox(inputId, label)
```

### Arguments

|         |                    |
|---------|--------------------|
| inputId | Checkbox Input id. |
| label   | Checkbox label.    |

---

diseaseSelect      *Create a disease selector server logic*

---

### Description

Only returns inputs associated with php1, hypopara, hypoD3

### Usage

```
diseaseSelect(input, output, session)
```

### Arguments

|         |                 |
|---------|-----------------|
| input   | Shiny inputs    |
| output  | Shiny Outputs   |
| session | Session object. |

---

|                 |  |
|-----------------|--|
| diseaseSelectUi | <i>Create a disease selector UI module</i> |
|-----------------|--|

---

**Description**

Contains php1, hypopara, hypoD3

**Usage**

```
diseaseSelectUi(id)
```

**Arguments**

|    |            |
|----|------------|
| id | module id. |
|----|------------|

---

|                     |   |
|---------------------|---|
| extract_running_sim | <i>Extract the current running simulation</i> |
|---------------------|---|

---

**Description**

Simulations are currently php1, hypoD3 and hypopara. Takes diseases as input given by the [diseaseSelect](#) module.

**Usage**

```
extract_running_sim(diseases)
```

**Arguments**

|          |   |
|----------|---|
| diseases | Shiny input disease selector. See <a href="#">diseaseSelect</a> . |
|----------|---|

---

|            |   |
|------------|---|
| fullScreen | <i>Create a fullScreen server logic</i> |
|------------|---|

---

**Description**

Nothing is contained inside for now...

**Usage**

```
fullScreen(input, output, session)
```

**Arguments**

|         |                 |
|---------|-----------------|
| input   | Shiny inputs    |
| output  | Shiny Outputs   |
| session | Session object. |

---

|              |                                      |
|--------------|--------------------------------------|
| fullScreenUI | <i>Create a fullScreen UI module</i> |
|--------------|--------------------------------------|

---

**Description**

Trigger a fullScreen mode. Based on <https://stackoverflow.com/questions/42371164/how-to-run-r-shiny-app-in-full-sized-window>

**Usage**

```
fullScreenUI(id)
```

**Arguments**

|    |            |
|----|------------|
| id | module id. |
|----|------------|

---

|                |                              |
|----------------|------------------------------|
| generate_edges | <i>CaPO4 Edges Generator</i> |
|----------------|------------------------------|

---

**Description**

Generate edges for the CaPO4 network

**Usage**

```
generate_edges(
  components,
  organs,
  regulations,
  diseases,
  organs_edges_size,
  hormones_edges_size
)
```

**Arguments**

|                     |   |
|---------------------|---|
| components          | Shiny input CaPO4 component selector. See <a href="#">networkOptions</a> .  |
| organs              | Shiny input to toggle organs display. See <a href="#">networkOptions</a> .  |
| regulations         | Shiny input to toggle hormone display. See <a href="#">networkOptions</a> . |
| diseases            | Shiny input disease selector. See <a href="#">diseaseSelect</a> .           |
| organs_edges_size   | Shiny input for organs edges size. See <a href="#">networkOptions</a> .     |
| hormones_edges_size | Shiny input for hormones edges size. See <a href="#">networkOptions</a> .   |

---

|                  |                                |
|------------------|--------------------------------|
| generate_network | <i>CaPO4 Network Generator</i> |
|------------------|--------------------------------|

---

### Description

Create a CaPO4 network taking nodes and edges as inputs

### Usage

```
generate_network(nodes, edges, usephysics = FALSE, isMobile)
```

### Arguments

|            |  |
|------------|--|
| nodes      | A dataframe of nodes provided by <a href="#">generate_nodes</a> .    |
| edges      | A dataframe of edges provided by <a href="#">generate_edges</a> .    |
| usephysics | Whether to use physic. FALSE by default. A visNetwork API parameter. |
| isMobile   | Shiny input checking if the app is running on a cellphone/tablet.    |

---

|                |                              |
|----------------|------------------------------|
| generate_nodes | <i>CaPO4 Nodes Generator</i> |
|----------------|------------------------------|

---

### Description

Generate nodes for the CaPO4 network

### Usage

```
generate_nodes(
  components,
  organs,
  regulations,
  background,
  diseases,
  organs_nodes_size,
  hormones_nodes_size
)
```

### Arguments

|             |   |
|-------------|---|
| components  | Shiny input CaPO4 component selector. See <a href="#">networkOptions</a> .  |
| organs      | Shiny input to toggle organs display. See <a href="#">networkOptions</a> .  |
| regulations | Shiny input to toggle hormone display. See <a href="#">networkOptions</a> . |
| background  | Shiny input background selector. See <a href="#">networkOptions</a> .       |

|                     |   |
|---------------------|---|
| diseases            | Shiny input disease selector. See <a href="#">diseaseSelect</a> .         |
| organs_nodes_size   | Shiny input for organs node size. See <a href="#">networkOptions</a> .    |
| hormones_nodes_size | Shiny input for hormones node size. See <a href="#">networkOptions</a> .. |

---

generate\_notification *Notifications Generator for CaPO4 animations*

---

### Description

Generate sequential notification as a function of the selected diseases. All notifications are in the notifications.R file in the inst/entry\_level app folder. Used in the [infos](#) module.

### Usage

```
generate_notification(simulation, counter, allowed)
```

### Arguments

|            |  |
|------------|--|
| simulation | Which disease is currently selected. See <a href="#">extract_running_sim</a> .                                       |
| counter    | To determine which notification to display. We expect a counter returned by the <a href="#">networkCaPO4</a> module. |
| allowed    | Whether to allow simulations. Expect logical value. See <a href="#">infos</a> module.                                |

---

generate\_userFields *Generate user fields*

---

### Description

Use inside in the [userInfo](#). Function that helps in generating 4 users fields, image, stat1, stat2 and stat3, so as to reinject them in the header userMenu

### Usage

```
generate_userFields(diseases, sliderDisease)
```

### Arguments

|               |   |
|---------------|---|
| diseases      | Shiny input disease selector. See <a href="#">diseaseSelect</a> .                         |
| sliderDisease | Shiny slider input related to the current disease severity. See <a href="#">plotBox</a> . |

---

|               |                                     |
|---------------|-------------------------------------|
| glossaryCaP04 | <i>CaPO4 glossary server module</i> |
|---------------|-------------------------------------|

---

**Description**

Create a CaPO4 glossary

**Usage**

```
glossaryCaP04(input, output, session)
```

**Arguments**

|         |                 |
|---------|-----------------|
| input   | Shiny inputs    |
| output  | Shiny Outputs   |
| session | Session object. |

---

|                 |                                 |
|-----------------|---------------------------------|
| glossaryCaP04Ui | <i>CaPO4 glossary UI module</i> |
|-----------------|---------------------------------|

---

**Description**

Create a CaPO4 glossary

**Usage**

```
glossaryCaP04Ui(id)
```

**Arguments**

|    |            |
|----|------------|
| id | module id. |
|----|------------|

---

|           |                           |
|-----------|---------------------------|
| helpCaP04 | <i>Help server module</i> |
|-----------|---------------------------|

---

**Description**

Create the help section

**Usage**

```
helpCaP04(input, output, session)
```

**Arguments**

|         |                 |
|---------|-----------------|
| input   | Shiny inputs    |
| output  | Shiny Outputs   |
| session | Session object. |

---

|             |                       |
|-------------|-----------------------|
| helpCaP04Ui | <i>Help UI module</i> |
|-------------|-----------------------|

---

**Description**

Create a help button

**Usage**

```
helpCaP04Ui(id)
```

**Arguments**

|    |            |
|----|------------|
| id | module id. |
|----|------------|

---

infos *Info server module*

---

### Description

Create modals, alerts, ...

### Usage

```
infos(input, output, session, diseases, animation_counter, regulations)
```

### Arguments

|                   |  |
|-------------------|--|
| input             | Shiny inputs   |
| output            | Shiny Outputs  |
| session           | Session object.  |
| diseases          | Shiny input disease selector. See <a href="#">diseaseSelect</a> .                    |
| animation_counter | Give the current temporal state of the animation. See <a href="#">networkCaPO4</a> . |
| regulations       | Shiny input to toggle hormone display. See <a href="#">networkOptions</a> .          |

---

infosUi *Info UI module*

---

### Description

Create modals, alerts, ...

### Usage

```
infosUi(id)
```

### Arguments

|    |            |
|----|------------|
| id | module id. |
|----|------------|

infoSwitch      *Create a switch input for [infosUi](#)*

---

**Description**

Create a [prettySwitch](#).

**Usage**

```
infoSwitch(inputId, label)
```

**Arguments**

|         |                    |
|---------|--------------------|
| inputId | Checkbox Input id. |
| label   | Checkbox label.    |

---

make\_plot\_hypoD3      *Produce plots related to vitamin D3 deficiency ([hypoD3](#))*

---

**Description**

Use inside the [plotBox](#) module.

**Usage**

```
make_plot_hypoD3(sliderVal, isMobile)
```

**Arguments**

|           |   |
|-----------|---|
| sliderVal | Shiny slider input related to the current disease severity. See <a href="#">plotBox</a> . |
| isMobile  | Shiny input useful to scale elements based on the device screen size.                     |

---

make\_plot\_hyopara      *Produce plots related to [hypoparathyroidism \(hyopara\)](#)*

---

**Description**

Use inside the [plotBox](#) module.

**Usage**

```
make_plot_hyopara(sliderVal, isMobile)
```

**Arguments**

|           |   |
|-----------|---|
| sliderVal | Shiny slider input related to the current disease severity. See <a href="#">plotBox</a> . |
| isMobile  | Shiny input useful to scale elements based on the device screen size.                     |

---

|                |  |
|----------------|--|
| make_plot_php1 | <i>Produce plots related to primary hyperparathyroidism (php1)</i> |
|----------------|--|

---

**Description**

Use inside the [plotBox](#) module.

**Usage**

```
make_plot_php1(sliderVal, isMobile)
```

**Arguments**

|           |   |
|-----------|---|
| sliderVal | Shiny slider input related to the current disease severity. See <a href="#">plotBox</a> . |
| isMobile  | Shiny input useful to scale elements based on the device screen size.                     |

---

|            |                           |
|------------|---------------------------|
| myCarousel | <i>carousel container</i> |
|------------|---------------------------|

---

**Description**

Creates a carousel. Adapted from shinydashboardplus to also allow control of the carousel animation

**Usage**

```
myCarousel(  
  ...,  
  id,  
  indicators = TRUE,  
  width = 6,  
  .list = NULL,  
  data.interval = 5000,  
  data.ride = "carousel"  
)
```

**Arguments**

|            |  |
|------------|--|
| ...        | Slot for <a href="#">carouselItem</a>  |
| id         | Carousel id. Must be unique.   |
| indicators | Whether to display left and right indicators.  |
| width      | Carousel width. 6 by default.  |
| .list      | Should you need to pass <a href="#">carouselItem</a> via <a href="#">lapply</a> or similar, put these item here instead of passing them in ... |

|               |  |
|---------------|--|
| data.interval | specify data-interval in ms. 5000ms by default, set to "false" to prevent automated animation of the slides. |
| data.ride     | specify data-ride. "carousel" by default.  |

---

networkCaPO4

*CaPO4 Network server module*


---

## Description

Create a CaPO4 network

## Usage

```
networkCaPO4(
  input,
  output,
  session,
  isMobile,
  components,
  organs,
  regulations,
  background,
  diseases,
  organs_nodes_size,
  hormones_nodes_size,
  organs_edges_size,
  hormones_edges_size,
  help
)
```

## Arguments

|                   |   |
|-------------------|---|
| input             | Shiny inputs  |
| output            | Shiny Outputs   |
| session           | Session object.   |
| isMobile          | Shiny input checking if the app is running on a cellphone/tablet.           |
| components        | Shiny input CaPO4 component selector. See <a href="#">networkOptions</a> .  |
| organs            | Shiny input to toggle organs display. See <a href="#">networkOptions</a> .  |
| regulations       | Shiny input to toggle hormone display. See <a href="#">networkOptions</a> . |
| background        | Shiny input background selector. See <a href="#">networkOptions</a> .       |
| diseases          | Shiny input disease selector. See <a href="#">diseaseSelect</a> .           |
| organs_nodes_size | Shiny input for organs node size. See <a href="#">networkOptions</a> .      |

|                     |   |
|---------------------|---|
| hormones_nodes_size | Shiny input for hormones node size. See <a href="#">networkOptions</a> .  |
| organs_edges_size   | Shiny input for organs edges size. See <a href="#">networkOptions</a> .   |
| hormones_edges_size | Shiny input for hormones edges size. See <a href="#">networkOptions</a> . |
| help                | Help input.   |

---

|                |                                |
|----------------|--------------------------------|
| networkCaPO4Ui | <i>CaPO4 Network UI module</i> |
|----------------|--------------------------------|

---

**Description**

Create a CaPO4 network

**Usage**

```
networkCaPO4Ui(id)
```

**Arguments**

|    |            |
|----|------------|
| id | module id. |
|----|------------|

---

|                |  |
|----------------|--|
| networkOptions | <i>CaPO4 Network Options server module</i> |
|----------------|--|

---

**Description**

Create a CaPO4 network options

**Usage**

```
networkOptions(input, output, session, mobile)
```

**Arguments**

|         |   |
|---------|---|
| input   | Shiny inputs  |
| output  | Shiny Outputs   |
| session | Session object.   |
| mobile  | Whether we are on cellphone/tablets or not. Slot for input\$ismobile(). |

---

|                  |  |
|------------------|--|
| networkOptionsUi | <i>CaPO4 Network Options UI module</i> |
|------------------|--|

---

**Description**

Options for the network

**Usage**

```
networkOptionsUi(id)
```

**Arguments**

|    |           |
|----|-----------|
| id | module id |
|----|-----------|

---

|         |                               |
|---------|-------------------------------|
| plotBox | <i>plot box server module</i> |
|---------|-------------------------------|

---

**Description**

Create modals, alerts, ...

**Usage**

```
plotBox(input, output, session, diseases, help, isMobile)
```

**Arguments**

|          |   |
|----------|---|
| input    | Shiny inputs  |
| output   | Shiny Outputs   |
| session  | Session object.   |
| diseases | Shiny input disease selector. See <a href="#">diseaseSelect</a> .     |
| help     | Help input.   |
| isMobile | Shiny input useful to scale elements based on the device screen size. |

---

|           |                           |
|-----------|---------------------------|
| plotBoxUi | <i>plot box UI module</i> |
|-----------|---------------------------|

---

**Description**

Create modals, alerts, ...

**Usage**

```
plotBoxUi(id)
```

**Arguments**

|    |            |
|----|------------|
| id | module id. |
|----|------------|

---

|              |   |
|--------------|---|
| run_CaP04Sim | <i>Launch the virtual patient simulator</i> |
|--------------|---|

---

**Description**

Unleash the virtual patient simulator

**Usage**

```
run_CaP04Sim(context = c("introduction", "virtual-patient"))
```

**Arguments**

|         |  |
|---------|--|
| context | Choose between c("introduction", "virtual-patient"). |
|---------|--|

**Examples**

```
if (interactive()) {  
  run_CaP04Sim(context = "introduction")  
  run_CaP04Sim(context = "virtual-patient")  
}
```

---

|            |   |
|------------|---|
| skinSelect | <i>Dashboard skin selector, server side</i> |
|------------|---|

---

**Description**

Select the shinydashboard skin you want

**Usage**

```
skinSelect(input, output, session)
```

**Arguments**

|         |                 |
|---------|-----------------|
| input   | Shiny inputs    |
| output  | Shiny Outputs   |
| session | Session object. |

---

|              |   |
|--------------|---|
| skinSelectUi | <i>Dashboard skin selector, ui side</i> |
|--------------|---|

---

**Description**

Select the shinydashboard skin you want

**Usage**

```
skinSelectUi(id)
```

**Arguments**

|    |            |
|----|------------|
| id | module id. |
|----|------------|

---

|          |                                      |
|----------|--------------------------------------|
| userInfo | <i>CaPO4 user info server module</i> |
|----------|--------------------------------------|

---

**Description**

Create a CaPO4 user info card

**Usage**

```
userInfo(input, output, session, diseases, sliderDisease, help)
```

**Arguments**

|               |  |
|---------------|--|
| input         | Shiny inputs   |
| output        | Shiny Outputs  |
| session       | Session object.  |
| diseases      | Shiny input disease selector. See <a href="#">diseaseSelect</a> .    |
| sliderDisease | Shiny input disease severity selector. See <a href="#">plotBox</a> . |
| help          | Help input.  |

---

|            |                                  |
|------------|----------------------------------|
| userInfoUi | <i>CaPO4 user info UI module</i> |
|------------|----------------------------------|

---

**Description**

Create a CaPO4 user info card

**Usage**

```
userInfoUi(id)
```

**Arguments**

|    |            |
|----|------------|
| id | module id. |
|----|------------|

---

|       |                                    |
|-------|------------------------------------|
| video | <i>Create a video server logic</i> |
|-------|------------------------------------|

---

**Description**

Nothing is contained inside for now...

**Usage**

```
video(input, output, session)
```

**Arguments**

|         |                 |
|---------|-----------------|
| input   | Shiny inputs    |
| output  | Shiny Outputs   |
| session | Session object. |

---

|         |                                 |
|---------|---------------------------------|
| videoUi | <i>Create a movie UI module</i> |
|---------|---------------------------------|

---

**Description**

Contains php1, hypopara, hypoD3

**Usage**

```
videoUi(id, data)
```

**Arguments**

|      |             |
|------|-------------|
| id   | module id.  |
| data | Video data. |

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