electronic diaries to record infusion events. Unfortunately, such diaries do not provide actionable data from which a patient is able to plan activity levels. For example, with current systems, patients are unable to ascertain a risk of bleeding if the patient were to participate in an activity such as playing soccer at any point in time after an infusion event. In particular, with current electronic diaries, patients cannot determine their factor level at any given point in time after a prophylactic infusion event, significantly limiting the usefulness of the information provided by such sources.

SUMMARY

In one aspect, the present disclosure refers to a drug monitoring tool, the tool comprising: a data receiver configured to receive, from a secured server, a pharmacokinetic (PK) profile of a patient, wherein the secured server comprises: (I) a Bayesian model of pharmacokinetic (PK) profiles of sampled patients, the Bayesian model including (i) a therapeutic plasma protein clearance and (ii) a volume of distribution relationship for a therapeutic plasma protein based upon at least one of patient age or body weight, and (II) a PK server configured to determine the patient PK profile based upon the Bayesian model, and at least one of a bodyweight, von Willebrand factor level, and an age of the patient; and an interactive user interface configured to: display to the patient a graphical representation predictive of a time–varying therapeutic plasma protein level of the patient, the time-varying therapeutic plasma protein level being determined by the drug monitoring tool based on an administered dose of a clotting factor VIII and the PK profile of the patient; and delineate a plurality of zones within the graphical representation associated with the time-varying therapeutic plasma protein level, the plurality of zones comprising at least: a safe zone indicating to the patient that the time-varying therapeutic plasma protein level is within a first concentration range considered safe for physical activity; and a danger zone indicating to the patient that the time-varying therapeutic plasma protein level is within a second concentration range and physical activity should be limited. In yet another aspect, the present disclosure refers to a method for drug monitoring executed by a drug monitoring tool, the method comprising: receiving, at a user device, a pharmacokinetic (PK) profile of a patient for a therapeutic plasma protein from a server system that

determines the PK profile based on a Bayesian model of sampled patients and at least one of a bodyweight, a von Willebrand factor level, and an age of a patient; determining, by the user device, time-varying levels of the therapeutic plasma protein predicted using the patient PK profile to result in the patient from an administered dose of the therapeutic plasma protein; and displaying, via an interactive user interface of the user device, the time-varying levels of the therapeutic plasma protein predicted in the patient within a plurality of zones, the time-varying levels of the therapeutic plasma protein being positioned within either: a safe zone indicating to the patient that the time-varying levels of the therapeutic plasma protein is within a first concentration considered safe for physical activity; or a danger zone indicating to the patient that the time-varying levels of the therapeutic plasma protein is within a second concentration and physical activity should be limited. In yet another aspect, the present disclosure refers to a drug monitoring system, the system comprising: a therapeutic plasma protein dosing regimen apparatus comprising: a model generator configured to create a Bayesian model of pharmacokinetic (PK) profiles of sampled patients, the Bayesian model including (i) a therapeutic plasma protein clearance and (ii) a volume of distribution relationship for a therapeutic plasma protein based upon at least one of patient age or body weight, and a PK server configured to: determine an approximate PK profile of a patient based upon the Bayesian model, a half-life of the therapeutic plasma protein within the patient, and at least one of an age of the patient or a weight of the patient, determine the therapeutic plasma protein dosing regimen including a dosage and a therapeutic plasma protein level over a time period based upon the approximate PK profile of the patient, modify the therapeutic plasma protein dosing regimen in response to receiving a dosing interval for applying a dosage to the patient, and transmit the modified therapeutic plasma protein dosing regimen to a client device; and a drug monitoring tool comprising: a data receiver configured to receive the (PK) profile of a patient, and an interactive user interface configured to display to the patient a graphical representation of a time–varying therapeutic plasma protein level of the patient, the time-varying therapeutic plasma protein level based on an administered dose of a clotting factor VIII and the PK profile of the patient; and delineate a plurality of zones within the graphical representation associated with the time-varying therapeutic plasma protein level, the plurality of zones comprising at

least: a safe zone indicating to the patient that the time-varying therapeutic plasma protein level is within a first concentration range considered safe for physical activity; and a danger zone indicating to the patient that the time-varying therapeutic plasma protein level is within a second concentration range and physical activity should be limited.

Examples of the present disclosure provide a drug monitoring tool that enables a patient to view a personalized, real-time indication of clotting factor VIII levels following a prophylactic infusion event. Advantageously, the disclosed drug monitoring tool allows a patient to significantly reduce bleeding events. For instance, the real-time indication of clotting factor VIII provided by the drug monitoring tool enables the patient to make informed decisions related to an amount and/or intensity of physical activity at any given point in time. In an example in which the drug monitoring tool provides an indication of a low level of clotting factor VIII, the patient may refrain from participating in a physically demanding activity such as a sport, decide to self-administer a non-prophylactic dose of clotting factor VIII in order to participate in the physically demanding activity, or choose a low bleed risk activity (e.g., a stationary activity such as reading a book) until the next prophylactic infusion. Thus, the drug monitoring tool advantageously eliminates patient bleed events due to a lack of actionable information.

In one example, a drug monitoring tool comprises a data receiver configured to receive a pharmacokinetic (PK) profile of a patient. The tool also comprises an interactive user interface configured to present to a patient a time–varying drug concentration level in the patient. The time-varying drug concentration level is based on an administered dose of a subject drug and the PK profile of the patient.

In another example, disclosed is a drug monitoring tool. The tool comprises a data receiver configured to receive a pharmacokinetic (PK) profile of a patient. In

CLAIMS

What is claimed is:

1. A drug monitoring tool, the tool comprising:

a data receiver configured to receive, from a secured server, a pharmacokinetic (PK) profile of a patient, wherein the secured server comprises: (I) a Bayesian model of pharmacokinetic (PK) profiles of sampled patients, the Bayesian model including (i) a therapeutic plasma protein clearance and (ii) a volume of distribution relationship for a therapeutic plasma protein based upon at least one of patient age or body weight, and (II) a PK server configured to determine the patient PK profile based upon the Bayesian model, and at least one of a bodyweight, von Willebrand factor level, and an age of the patient; and

an interactive user interface configured to:

display to the patient a graphical representation predictive of a time–varying therapeutic plasma protein level of the patient, the time-varying therapeutic plasma protein level being determined by the drug monitoring tool based on an administered dose of a clotting factor VIII and the PK profile of the patient; and

delineate a plurality of zones within the graphical representation associated with the time-varying therapeutic plasma protein level, the plurality of zones comprising at least:

a safe zone indicating to the patient that the time-varying therapeutic plasma protein level is within a first concentration range considered safe for physical activity; and

a danger zone indicating to the patient that the time-varying therapeutic plasma protein level is within a second concentration range and physical activity should be limited.

2. The drug monitoring tool of claim 1 wherein:

the data receiver is a camera configured to scan a quick response (QR) code storing patient information that includes at least PK profile information; and

the drug monitoring tool further comprising a QR code processor configured to extract and process the patient information stored within the QR code.

3. The drug monitoring tool of claim 1 wherein the data receiver is a communications interface configured to receive the PK profile from the secured server, the received PK profile being encrypted and the communications interface further configured to decrypt the encrypted PK profile.

4. The drug monitoring tool of claim 2 further comprising a QR code generator configured to generate the QR code having patient information encrypted using AES–256 encryption with cipher block chaining (CBC) and public-key cryptography standards (PKCS) padding.

5. The drug monitoring tool of claim 4 wherein the QR code generator is located at a secured server remote from the drug monitoring tool.

6. The drug monitoring tool of claim 2 wherein the QR code includes at least one of or any combination of: patient identifying information, patient physiological data, patient dosing information, and/or PK profile information of the patient, wherein the patient dosing information includes a prophylactic dosing regimen for a particular clotting factor VIII drug.

7. The drug monitoring tool of claim 1 further comprising an activation toolkit configured to enable access to functionalities of the drug monitoring tool in response to at least of: receiving the PK profile the patient and/or receiving a log of a first prophylactic infusion.

8. The drug monitoring tool of claim 1 wherein the interactive user interface includes a graphical control element configured to receive patient input corresponding to a request for the time-varying therapeutic plasma protein level within the patient at a particular time; and wherein the interactive user interface is configured to display the graphical representation of the time varying therapeutic plasma protein level within the patient at the particular time.

9. The drug monitoring tool of claim 8 wherein the graphical control element is slidable between the plurality of zones.

10. The drug monitoring tool of claim 1, wherein the graphical representation provides an estimated amount of time until the time-varying therapeutic plasma protein level reaches the danger zone.

11. A method for drug monitoring executed by a drug monitoring tool, the method comprising:

receiving, at a user device, a pharmacokinetic (PK) profile of a patient for a therapeutic plasma protein from a server system that determines the PK profile based on a Bayesian model of sampled patients and at least one of a bodyweight, a von Willebrand factor level, and an age of a patient;

determining, by the user device, time-varying levels of the therapeutic plasma protein predicted using the patient PK profile to result in the patient from an administered dose of the therapeutic plasma protein; and

displaying, via an interactive user interface of the user device, the time-varying levels of the therapeutic plasma protein predicted in the patient within a plurality of zones, the time-varying levels of the therapeutic plasma protein being positioned within either:

a safe zone indicating to the patient that the time-varying levels of the therapeutic plasma protein is within a first concentration considered safe for physical activity; or

a danger zone indicating to the patient that the time-varying levels of the therapeutic plasma protein is within a second concentration and physical activity should be limited.

12. The method of claim 11 wherein:

receiving the PK profile includes scanning a quick response (QR) code storing patient information that includes at least PK profile information; and

extracting and processing the patient information stored within the QR code.

13. The method of claim 11 further comprising receiving the PK profile in an encrypted format; and decrypting the encrypted PK profile.

14. The method of claim 12 further comprising generating the QR code having patient information encrypted using AES–256 encryption with cipher block chaining (CBC) and public-key cryptography standards (PKCS) padding.

15. The method of claim 12 wherein the QR code includes at least one of or any combination of: patient identifying information, patient physiological data, patient dosing information, and/or PK profile information of the patient, wherein the patient dosing information includes a prophylactic dosing regimen for a particular clotting factor VIII drug.

16. The method of claim 11 further comprising enabling patient access to functionalities of the drug monitoring tool in response to at least of: receiving the PK profile the patient and/or receiving a log of a first prophylactic infusion.

17. The method of claim 11, wherein each zone is associated with a particular concentration range of the time-varying amount of the therapeutic plasma protein within the patient.

18. The method of claim 17 further comprising:

providing a graphical control element configured to receive patient input corresponding to a request for the time-varying amount of the therapeutic plasma protein within the patient at a particular time; and

displaying the graphical representation of the time varying amount of the therapeutic plasma protein within the patient at the particular time.

19. The method of claim 18 wherein the graphical control element is slidable between the plurality of zones.

20. A drug monitoring system, the system comprising:

a therapeutic plasma protein dosing regimen apparatus comprising:

a model generator configured to create a Bayesian model of pharmacokinetic (PK) profiles of sampled patients, the Bayesian model including (i) a therapeutic plasma protein clearance and (ii) a volume of distribution relationship for a therapeutic plasma protein based upon at least one of patient age or body weight, and

a PK server configured to:

determine an approximate PK profile of a patient based upon the Bayesian model, a half-life of the therapeutic plasma protein within the patient, and at least one of an age of the patient or a weight of the patient,

determine the therapeutic plasma protein dosing regimen including a dosage and a therapeutic plasma protein level over a time period based upon the approximate PK profile of the patient,

modify the therapeutic plasma protein dosing regimen in response to receiving a dosing interval for applying a dosage to the patient, and

transmit the modified therapeutic plasma protein dosing regimen to a client device; and

a drug monitoring tool comprising:

a data receiver configured to receive the PK profile of a patient, and

an interactive user interface configured to:

display to the patient a graphical representation of a time–varying therapeutic plasma protein level of the patient, the time-varying therapeutic plasma protein level based on an administered dose of a clotting factor VIII and the PK profile of the patient; and

delineate a plurality of zones within the graphical representation associated with the time-varying therapeutic plasma protein level, the plurality of zones comprising at least:

a safe zone indicating to the patient that the time-varying therapeutic plasma protein level is within a first concentration range considered safe for physical activity; and

a danger zone indicating to the patient that the time-varying therapeutic plasma protein level is within a second concentration range and physical activity should be limited.