

What is claimed is:

1. A system for providing analytics relating to patients and surgeries, the system comprising:

a data repository storing analytics data associated with one or more patients; and

a data analysis service comprising computer hardware, wherein the data analysis service is configured to at least:

receive a first request to analyze a plurality of patients, wherein the first request includes (i) biological traits data associated with the plurality of patients, (i) step count data generated by a plurality of respective user computing devices associated with the plurality of patients, and (iii) surgery data associated with the plurality of patients; and

for each respective patient of the plurality of patients:

identify a set of temporal windows based at least in part on the step count data associated with the respective patient;

select, from the set of temporal windows, a first temporal window prior to a surgery date associated with the respective patient and a second temporal window subsequent to the surgery date;

generate a surgical efficacy score based at least in part on a comparison of first step count data associated with the first temporal window and second step count data associated with the second temporal window; and

store the surgical efficacy score in association with (a) at least a portion of the biological traits data associated with the respective patient and (b) at least a portion of the surgery data associated with the respective patient, such that the surgical efficacy score associated with the respective patient is retrievable in a biological-trait-specific and surgery-specific manner,

wherein the data analysis service is further configured to:

receive a second request to analyze a first patient not included in the plurality of patients, wherein the second request includes (i) first biological traits data associated with the first patient, (ii) first step count data associated with the first patient, and (iii) a first surgery type;

retrieve, from the data repository, first analytics data based at least in part on the first biological traits data and the first surgery type, wherein the first analytics data is a subset of the analytics data stored in the data repository that corresponds to at least a portion of the first biological traits data and the first surgery type;

determine, based at least in part on the first analytics data and the first step count data associated with the first patient, (a) a predicted surgical efficacy score associated with performing a first surgery of the first surgery type on the first patient and (b) a predicted pattern of post-surgery recovery associated with performing the first surgery on the first patient; and

output a report associated with the first patient, wherein the report indicates at least the predicted surgical efficacy score and the predicted pattern of recovery.

2. The system of claim 1, wherein the surgical efficacy score is calculated by dividing a first average value of the second step count data over the second temporal window by a second average value of the first step count data over the first temporal window.

3. The system of claim 1, wherein the predicted pattern of post-surgery recovery is determined by aggregating a post-operative portion of the step count data of a subset of the plurality of patients that share a set of the same biological traits of the first patient.

4. The system of claim 1, wherein the data analysis service is further configured to:
determine the predicted surgical efficacy score for each of a plurality of surgeries including the first surgery; and

output a recommendation for the first surgery based at least in part on (i) the predicted surgical efficacy score associated with the first surgery being the highest out of

the plurality of surgeries, and (ii) the predicted surgical efficacy score associated with the first surgery indicating that the first surgery is predicted to result in at least a threshold level of mobility improvement for the first patient.

5. The system of claim 1, wherein the step count data comprises, for a given patient of the plurality of patients, a number of steps estimated to be taken by the given patient based on sensor data captured by one or more sensors of a smartphone associated with the given patient, wherein the one or more sensors include one or more of an accelerometer, a gyroscope, a global positioning system (GPS) sensor, a compass, a magnetometer, or a barometer.

6. The system of claim 1, wherein the step count data is collected by a mobile application installed on each of the plurality of respective user computing devices associated with the plurality of patients and transmitted to a data repository accessible by the data analysis service.

7. The system of claim 1, wherein the data analysis service is further configured to:
identify a first subset of the analytics data corresponding to a first subset of patients of the plurality of patients who have undergone the first surgery and are associated with a first set of biological traits;
identify a second subset of the analytics data corresponding to a second subset of patients of the plurality of patients who have undergone the first surgery and are associated with a second set of biological traits different from the first set of biological traits; and
output an aggregate report including (i) a first surgical efficacy score associated with the first surgery for the first subset of patients associated with the first set of biological traits, and (ii) a second surgical efficacy score associated with the first surgery for the second subset of patients associated with the second set of biological traits.

8. The system of claim 1, wherein the data analysis service is further configured to:
identify a first subset of the analytics data corresponding to a first subset of patients of the plurality of patients who have undergone the first surgery and are associated with a first set of biological traits;

identify a second subset of the analytics data corresponding to a second subset of patients of the plurality of patients who have undergone a second surgery different from the first surgery and are associated with the first set of biological traits; and

output an aggregate report including (i) a first surgical efficacy score associated with the first surgery for the first subset of patients associated with the first set of biological traits, and (ii) a second surgical efficacy score associated with the second surgery for the first subset of patients associated with the first set of biological traits.

9. A computer-implemented method for providing analytics relating to patients and medical interventions, the method comprising:

receiving a first request to analyze a plurality of patients, wherein the first request includes (i) biological traits data associated with the plurality of patients, (i) activity data associated with the plurality of patients, and (iii) medical intervention data associated with the plurality of patients;

for each respective patient of the plurality of patients:

identifying a set of temporal windows based at least in part on the activity data associated with the respective patient, wherein the set of temporal windows includes at least (i) a first temporal window prior to a medical intervention date associated with the respective patient, and (ii) a second temporal window subsequent to the medical intervention date;

generating analytics data including a medical intervention efficacy score based at least in part on a comparison of first activity data associated with the first temporal window and second activity data associated with the second temporal window; and

storing the analytics data in association with (a) at least a portion of the biological traits data associated with the respective patient and (b) at least a portion of the medical intervention data associated with the respective patient,

receiving a second request to analyze a first patient, wherein the second request includes (i) first biological traits data associated with the first patient, (ii) first activity data associated with the first patient, and (iii) first medical intervention data;

retrieving first analytics data based at least in part on the first biological traits data and the first medical intervention data, wherein the first analytics data is a subset of the analytics data generated based on the activity data associated with the plurality of patients that corresponds to at least a portion of the first biological traits data and the first medical intervention data;

determining, based at least in part on the first analytics data and the first activity data associated with the first patient, (a) a predicted medical intervention efficacy score associated with performing a first medical intervention associated with the first medical intervention data on the first patient and (b) a predicted pattern of post-intervention recovery associated with performing the first medical intervention on the first patient; and

outputting a report associated with the first patient, wherein the report indicates at least the predicted medical intervention efficacy score and the predicted pattern of recovery.

10. The computer-implemented method of claim 9, wherein the activity data includes one or more of step count, step size, distance traveled, or flights of stairs climbed.

11. The computer-implemented method of claim 9, wherein the medical intervention data includes one or more of a medical practitioner, a medical intervention date, a medical device used, a medical device manufacturer, a medical intervention duration, or a medical intervention time of day.

12. The computer-implemented method of claim 9, wherein the medical intervention efficacy score is calculated by dividing a first average value of the second activity data over the second temporal window by a second average value of the first activity data over the first temporal window.

13. The computer-implemented method of claim 9, wherein the predicted pattern of post-intervention recovery is determined by aggregating a post-operative portion of the activity data of a subset of the plurality of patients that share a set of the same biological traits of the first patient.

14. The computer-implemented method of claim 9, further comprising:
determining the predicted medical intervention efficacy score for each of a plurality of medical interventions associated with the first medical intervention data, wherein the plurality of medical interventions includes the first medical intervention; and
outputting a recommendation for the first medical intervention based at least in part on (i) the predicted medical intervention efficacy score associated with the first medical intervention being the highest out of the plurality of medical interventions, and (ii) the predicted medical intervention efficacy score associated with the first medical intervention indicating that the first medical intervention is predicted to result in at least a threshold level of mobility improvement for the first patient.

15. The computer-implemented method of claim 9, further comprising:
identifying a first subset of the analytics data corresponding to a first subset of patients of the plurality of patients who have undergone the first medical intervention and are associated with a first set of biological traits;
identifying a second subset of the analytics data corresponding to a second subset of patients of the plurality of patients who have undergone a second medical intervention different from the first medical intervention and are associated with the first set of biological traits; and
outputting an aggregate report including (i) a first medical intervention efficacy score associated with the first medical intervention for the first subset of patients associated with the first set of biological traits, and (ii) a second medical intervention efficacy score associated with the second medical intervention for the first subset of patients associated with the first set of biological traits.

16. A non-transitory computer-readable medium storing instructions that, when executed by a computing system, cause the computing system to perform operations comprising:
receiving a first request to analyze a plurality of patients, wherein the first request includes (i) biological traits data associated with the plurality of patients, (i) activity data associated with the plurality of patients, and (iii) medical intervention data associated with the plurality of patients;

for each respective patient of the plurality of patients:

identifying a set of temporal windows based at least in part on the activity data associated with the respective patient, wherein the set of temporal windows includes at least (i) a first temporal window prior to a medical intervention date associated with the respective patient, and (ii) a second temporal window subsequent to the medical intervention date;

generating analytics data including a medical intervention efficacy score based at least in part on a comparison of first activity data associated with the first temporal window and second activity data associated with the second temporal window; and

storing the analytics data in association with (a) at least a portion of the biological traits data associated with the respective patient and (b) at least a portion of the medical intervention data associated with the respective patient,

receiving a second request to analyze a first patient, wherein the second request includes (i) first biological traits data associated with the first patient, (ii) first activity data associated with the first patient, and (iii) first medical intervention data;

retrieving first analytics data based at least in part on the first biological traits data and the first medical intervention data, wherein the first analytics data is a subset of the analytics data generated based on the activity data associated with the plurality of patients that corresponds to at least a portion of the first biological traits data and the first medical intervention data;

determining, based at least in part on the first analytics data and the first activity data associated with the first patient, (a) a predicted medical intervention efficacy score associated with performing a first medical intervention associated with the first medical intervention data on the first patient and (b) a predicted pattern of post-intervention recovery associated with performing the first medical intervention on the first patient; and

outputting a report associated with the first patient, wherein the report indicates at least the predicted medical intervention efficacy score and the predicted pattern of recovery.

17. The non-transitory computer-readable medium of claim 16, wherein the medical intervention efficacy score is calculated by dividing a first average value of the second activity data over the second temporal window by a second average value of the first activity data over the first temporal window.

18. The non-transitory computer-readable medium of claim 16, wherein the predicted pattern of post-intervention recovery is determined by aggregating a post-operative portion of the activity data of a subset of the plurality of patients that share a set of the same biological traits of the first patient.

19. The non-transitory computer-readable medium of claim 16, storing further instructions that, when executed by the computing system, cause the computing system to perform operations comprising:

determining the predicted medical intervention efficacy score for each of a plurality of medical interventions associated with the first medical intervention data, wherein the plurality of medical interventions includes the first medical intervention; and

outputting a recommendation for the first medical intervention based at least in part on (i) the predicted medical intervention efficacy score associated with the first medical intervention being the highest out of the plurality of medical interventions, and (ii) the predicted medical intervention efficacy score associated with the first medical intervention indicating that the first medical intervention is predicted to result in at least a threshold level of mobility improvement for the first patient.

20. The non-transitory computer-readable medium of claim 16, storing further instructions that, when executed by the computing system, cause the computing system to perform operations comprising:

identifying a first subset of the analytics data corresponding to a first subset of patients of the plurality of patients who have undergone the first medical intervention and are associated with a first set of biological traits;

identifying a second subset of the analytics data corresponding to a second subset of patients of the plurality of patients who have undergone a second medical intervention

different from the first medical intervention and are associated with the first set of biological traits; and

outputting an aggregate report including (i) a first medical intervention efficacy score associated with the first medical intervention for the first subset of patients associated with the first set of biological traits, and (ii) a second medical intervention efficacy score associated with the second medical intervention for the first subset of patients associated with the first set of biological traits.