



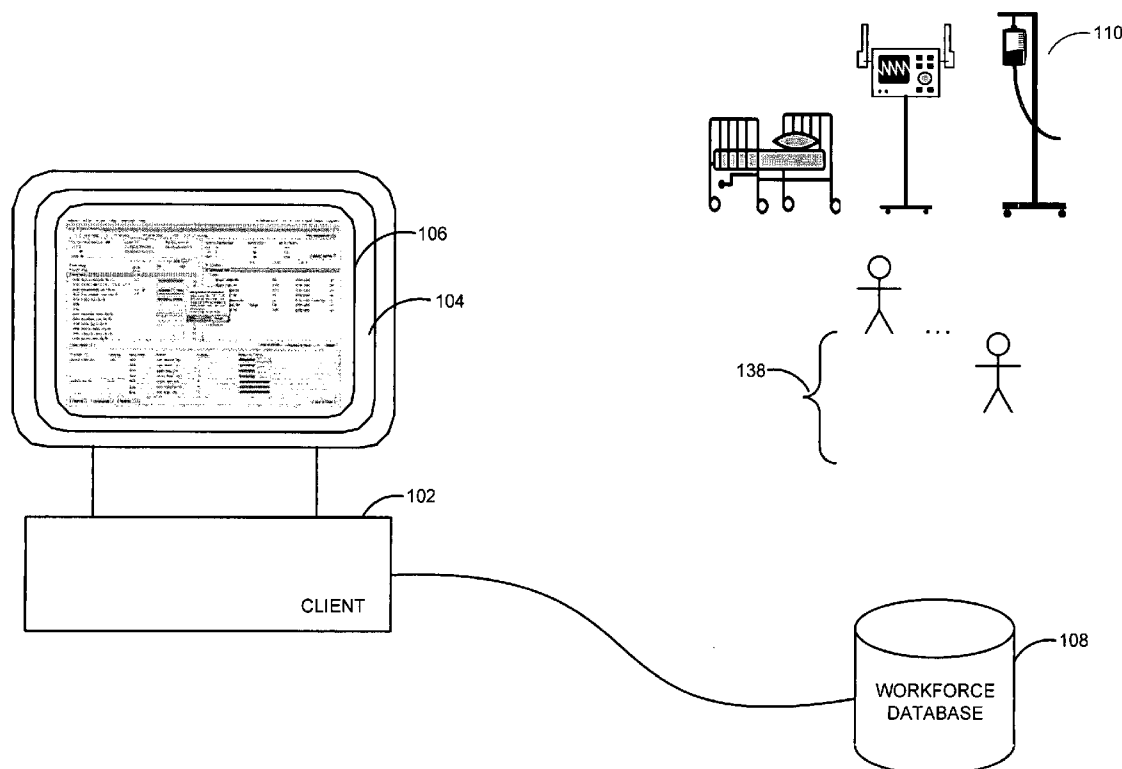
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(19) **United States**(12) **Patent Application Publication**  
**Wager**(10) **Pub. No.: US 2006/0149589 A1**(43) **Pub. Date: Jul. 6, 2006**(54) **SYSTEM AND METHOD FOR CLINICAL  
WORKFORCE MANAGEMENT INTERFACE**(57) **ABSTRACT**(75) Inventor: **Douglas W. Wager**, Kansas City, MO  
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A system and related techniques generate and present a clinical workforce management interface to assign nurses, technicians, therapists and others in a hospital or other clinical setting. According to embodiments, the interface may present components including an aggregate patient population profile which lists individual patients in a unit, as well as the projected workload capacity the care for those patients represents as well as an assignment bar depicting the continuity of provider assignments for that patient over a shift, 24 hour, or other period. The workforce management interface may likewise present a counterpart provider population profile which lists available care providers in a unit, as well as their capacity ratings, skill sets, shifts or other schedule and other data characterizing available clinical stuff. According to embodiments of the invention in one regard, a charge nurse or other staff manager may visually or graphically view and manipulate the provider-to-patient assignments, for instance by dragging and dropping icons or other visual elements to perform assignments. According to embodiments of the invention in another regard, compliance monitoring functions such as maintaining mandated patient to nurse or other provider ratios may be automatically performed, and the staff manager may be alerted when those or other ratios or criteria violate limits.



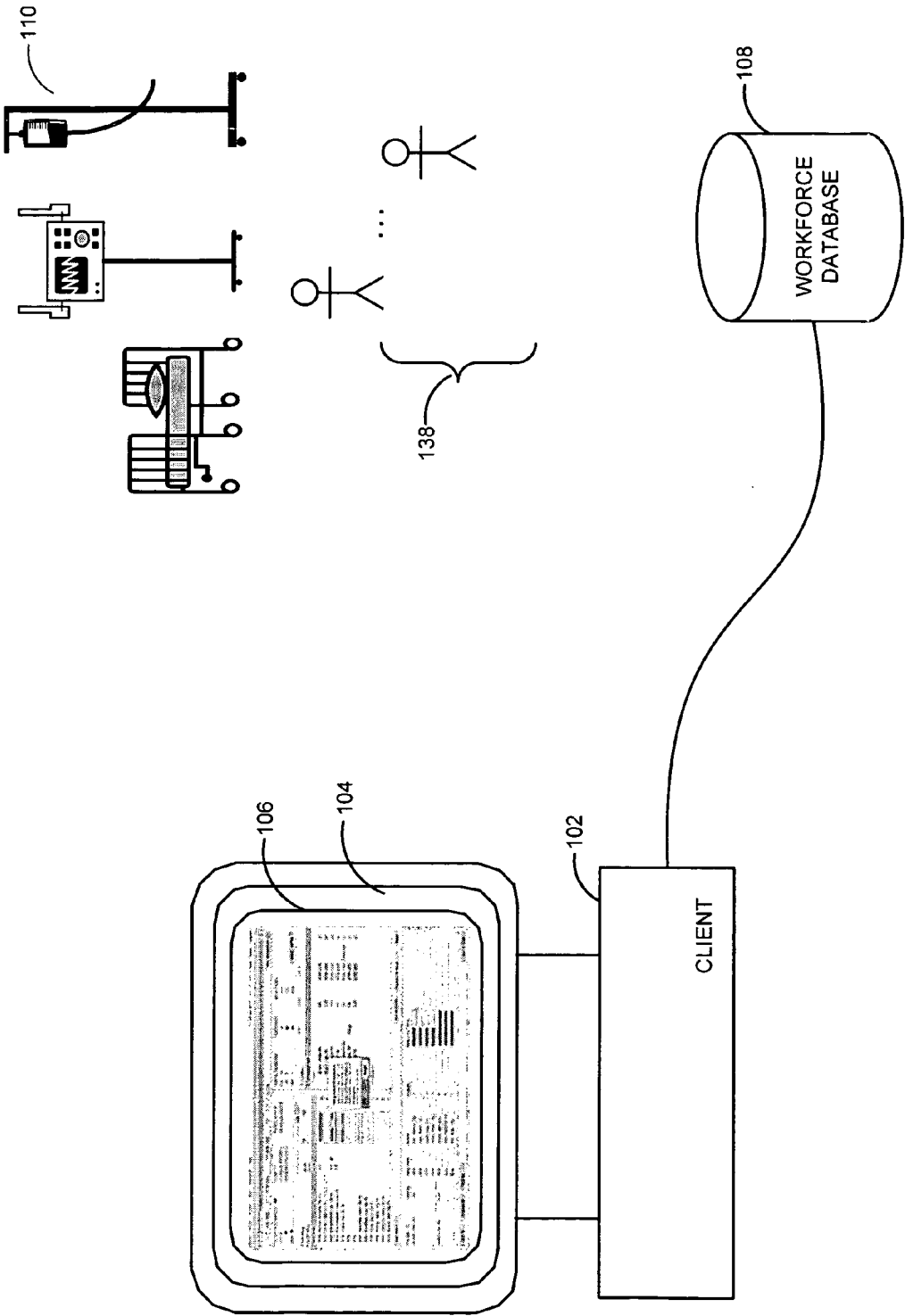


FIG. 1

106

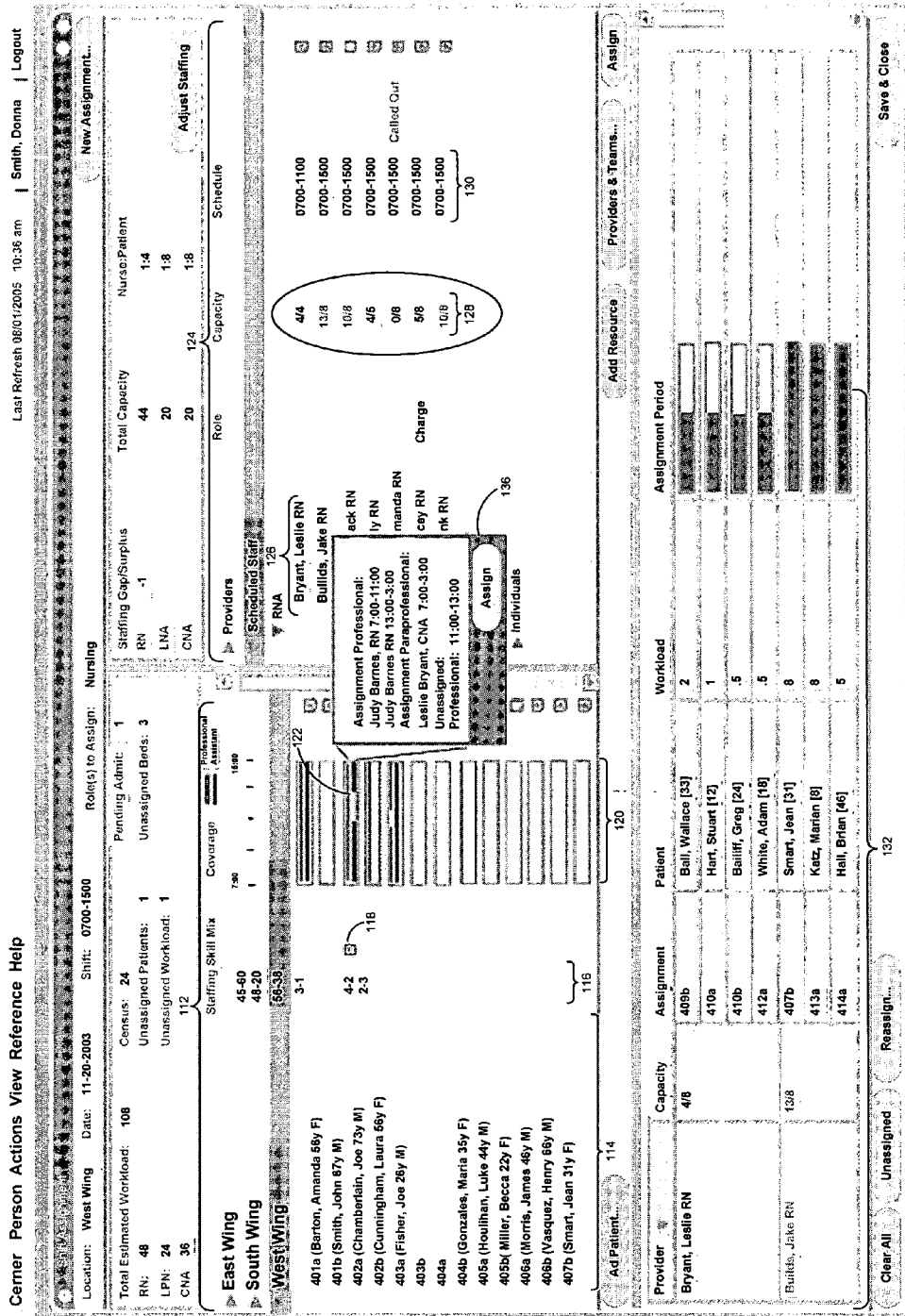


FIG. 2

106

Center Person Actions View Reference Help

Last Refresh 08/01/2005 10:35 am | Smith, Donna | Logout

Location: West Wing Date: 11-20-2003 Shift: 0700-1500

Total Estimated Workload: 108 Census: 24 Pending Admit: 1  
 RN: 48 Unassigned Patients: 1 Unassigned Beds: 3  
 LPN: 24 Unassigned Workload: 1  
 CNA: 36

Staffing Skill Mix: Coverage Professional Assistant  
 45-50 7:00 15:00  
 48-20 7:00 15:00

East Wing  
 South Wing  
 West Wing

401a (Barton, Amanda 56y F)  
 401b (Smith, John 67y M)  
 402a (Chambliss, Joe 73y M)  
 402b (Cunningham, Laura 56y F)  
 403a (Fisher, Joe 28y M)  
 403b  
 404a  
 404b (Gonzales, Maria 35y F)  
 405a (Houlihan, Luke 44y M)  
 405b (Miller, Becca 22y F)  
 406a (Morris, James 46y M)  
 406b (Vasquez, Henry 65y M)  
 407b (Smart, Jean 31y F)

Staffing Gap/Surplus  
 RN -1  
 LNA  
 CNA

Total Capacity 44  
 Total Capacity 20  
 Total Capacity 20

Role Capacity  
 Nurse: Patient 1:4  
 Nurse: Patient 1:8  
 Nurse: Patient 1:8

Adjust Staffing

Providers  
 Scheduled Staff  
 RNA  
 Bryant, Leslie RN  
 Bullds, Jake RN  
 Callaway, Jack RN  
 Dees, Sally RN

4/4  
 13/8  
 10/8  
 4/5  
 0/8  
 5/8  
 10/8

0700-1100  
 0700-1500  
 0700-1500  
 0700-1500  
 0700-1500  
 0700-1500  
 0700-1500

Called Out

Warning!  
 This assignment will cause Leslie Bryant to have 5 patients for the hours of 12:00-1:00. The maximum patients per care provider allowed in this unit is 4. You may:  
 Continue, and fix later Cancel Assign

134

Assign  
 Add Patient...  
 Provider Assignment Patient  
 Bryant, Leslie RN 408b Ball, Wallace  
 410a Hart, Stuart  
 410b Bailiff, Greg  
 412a White, Ada  
 407b Smart, Jean  
 413a Katz, Maria  
 414a Hall, Brian

Capacity 48  
 Capacity 13/8

Clear All Unassigned Reassign...  
 Save & Close

FIG. 3

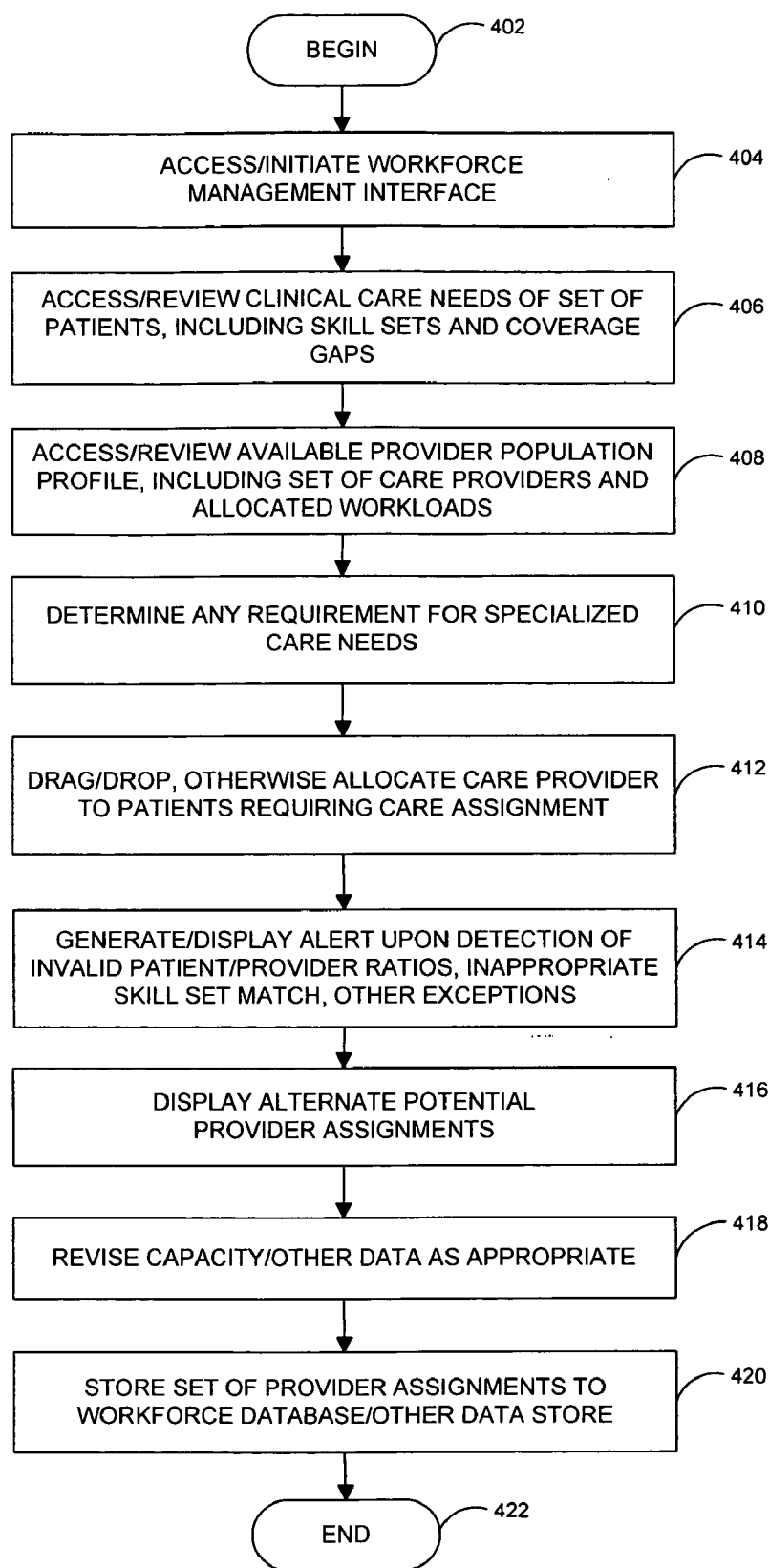


FIG. 4

## SYSTEM AND METHOD FOR CLINICAL WORKFORCE MANAGEMENT INTERFACE

### CROSS-REFERENCE TO RELATED APPLICATION

[0001] The subject matter of this application is related to the subject matter of copending U.S. patent application Ser. No. 10/679,836 filed Oct. 6, 2003, entitled "Computerized System and Method for Determining Work in a Healthcare Environment"; and to the subject matter of U.S. patent application Ser. No. 10/917,337 filed Aug. 13, 2004, entitled "System And Method For Automatically Generating Evidence-Based Assignment Of Care Providers To Patients", each of which applications is assigned or under obligation of assignment to the same entity as this application, and each of which applications is incorporated by reference herein.

### STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

[0002] Not applicable.

### FIELD OF THE INVENTION

[0003] The invention relates to the field of clinical information technology, and more particularly to a system and method for a management interface which presents a charge nurse or other staffing manager with an intuitive, visual interface for generating patient-to-care provider assignments, including capacity computation, skill set matching, ratio management and other parameters as part of that interface.

### BACKGROUND OF THE INVENTION

[0004] The healthcare environment continues to demand increased attention to and emphasis on clinical workforce management, including to deploy nurses, technicians, rehabilitation and other staff with better efficiency and clinical efficacy. Hospitals and other clinical sites furthermore may find themselves operating under federal, state or other compliance requirements which demand that the ratio of care providers to assigned patients adhere to specified ratios or that the staffing level is appropriate for the level of acuity of the relevant patient population. Those regulatory considerations combined with operational needs such as the need to continuously mix and adjust provider assignments under day to day schedule changes such as vacation time, lunch and other breaks, sick days, and other absences or developments make the task of promulgating shift-by-shift patient assignments a challenging one, for charge nurses and other clinical managers tasked with staffing duties.

[0005] Those staff managers moreover are frequently confronted with the need to generate provider/patient assignments with no formal or computerized tools to assist in that workforce management. Charge nurses or other unit or other managers thus must frequently rely on manual notes, memory and intuition to assemble a staff schedule and make appropriate provider-to-patient assignments on an ad hoc or short-term basis. Staff managers may moreover often have little time to generate such a floor schedule for the next shift, week or other period even on a manual basis. Other problems in clinical workforce management exist.

### SUMMARY OF THE INVENTION

[0006] The invention overcoming these and other problems in the art relates in one regard to a system and method

for a clinical workforce management interface, in which a staff manager may be presented with a suite of provider assignment options and alternatives, to automatically organize and drive assignment ratios and other assignment parameters and options with compliance, capacity, best practice and other criteria taken into account. According to embodiments of the invention in one regard, a visual or graphical interface or other presentation layer may present a charge nurse or other staff manager with a patient list including graphical or iconic representations of the continuity and types of assigned provider care for each patient, for instance in a slider bar showing continuity of provider assignments or any gaps therein, for example over a shift, 24 hours, week or other periods. In embodiments, the assignment bar, provider names, icons or other visual elements or objects may be manipulated, for instance dragged and dropped, to effect assignments, changes to assignments or other actions. The interface may likewise indicate the acuity or amount of work which a given patient's care will demand of a provider, and generate aggregate totals of the amount of capacity in a clinical unit available to serve the patient population. Mandated patient-to-provider ratios may automatically be monitored, and alerts may be presented when those or other compliance, operational or other criteria are violated. Because in one regard an entire range of workforce management functions may be integrated in one interface, and that interface or tool may automatically present and analyze core capacity and other variables and options, as well as store resulting assignments and schedules to distribute to staff and form a basis for or input to further schedules, the overall task of timely workforce assignments may be achieved more efficiently, compliance may be better ensured while capacity may be more effectively managed against fluctuating clinical demands.

### BRIEF DESCRIPTION OF THE DRAWINGS

[0007] **FIG. 1** illustrates a clinical workforce environment in which a system and method for a workforce management interface may operate, according to embodiments of the invention.

[0008] **FIG. 2** illustrates a workforce management interface, according to embodiments of the invention.

[0009] **FIG. 3** illustrates a workforce management interface including an alert, according to embodiments of the invention.

[0010] **FIG. 4** illustrates a flowchart of overall workforce management and interface processing, according to embodiments of the invention.

### DETAILED DESCRIPTION OF EMBODIMENTS

[0011] **FIG. 1** illustrates an environment in which a system and method for a clinical workforce management interface may operate, according to embodiments of the invention. As illustrated in that figure, a charge nurse or other personnel or staff manager may operate a client **102** having a graphical user interface **104** to initiate, access or execute a workforce management interface **106**. The staff manager may access the workforce management interface **106** before, during or after a work shift for a unit **110** such as an emergency room, acute care unit, post-operative unit or other section, division, department, floor or other organizational unit of a hospital or other clinical care facility. The

staff manager may operate the workforce management interface **106** to schedule shifts, generate care provider-to-patient assignments, review capacity loads and perform other personnel or staffing duties with respect to a care provider staff **138** which may be or include, for example, nurses, therapists, technicians, physicians, interns, or other clinical or other personnel whose responsibilities or activities are directed to or associated with patients in unit **110**, or otherwise.

[0012] According to embodiments of the invention as for example illustrated in **FIG. 2**, the workforce management interface **106** may include a range of views including graphical and numerical or textual indicators, activatable icons and other objects and resources to organize and visually present provider assignment information, in an integrated presentation layer or interface. According to embodiments as shown, those resources may include a patient population profile **112** which may be or include, for instance, a patient list **114** or other census or other enumeration of patients within unit **110**, or other grouping. The patient population profile **112** may include, for further example, a patient needs rating **116** indicating the rated amount of workload or work effort represented by a patient's care, for instance expressed in normalized units of person-hours, or other quantities or units. The patient population profile **112** may further include a set of skill criteria **118**, for instance indicating that the care of a particular patient requires specialized training, certification or skills, for example the training or competence to operate a high-frequency ventilator, or other skills.

[0013] According to embodiments of the invention in a further regard, and as likewise illustrated in **FIG. 2**, the patient population profile **112** may likewise include an assignment bar **120**, which may in one regard depict or represent the presence, absence or type of care provider assignment or coverage for a given patient in patient list **114**, over a scheduled period of time. For instance, the assignment bar **120** may indicate that for an eight-hour shift from 11 p.m. to 7 a.m. or other period, the patient is covered by assignment of a primary care nurse, or other personnel. Conversely, if a patient does not have a designated care provider for that or other period, the assignment bar **120** may display a gap **122**, such as a white or other visually distinct color or segment, to indicate that a patient has not received an assignment of a care provider for the represented period. According to embodiments of the invention in a further regard, the assignment bar **120** may be activatable, for example by highlighting or clicking, to display an expanded assignment view **136** which presents details on a particular patient's provider assignment or assignments and related information, including for instance the category of provider (e.g. professional), time period ranges for that provider, and the name or other identifier for that provider. Other data may be presented in expanded assignment view **136**.

[0014] According to embodiments of the invention as illustrated in **FIG. 2** in another regard, the workforce management interface **106** may likewise include views and resources directed to the pool of available care providers, including a provider population profile **124** which may contain a provider list **126** which may identify available care providers by name, or other designation. Provider population profile **124** may further contain a set of provider capacity ratings **128** which may indicate a given nurse's,

therapist's, technician's or other person's capacity to undertake patient care, for instance expressed in person-hours of care, or other units. According to further embodiments of the invention, the provider capacity ratings **128** may include or incorporate a scaling or adjustment factor to take a given provider's experience level, specialized training, patient continuity and other factors into account, in rating the amount of normalized patient care that provider may contribute. According to embodiments of the invention in one regard, the provider capacity ratings **128** or other projected or estimated work capacity or production ratings may be generated by or accessed from a capacity platform or engine such as that described in the aforementioned U.S. patent application Ser. No. 10/679,836, or other platforms, systems or resources. Other computations or expressions of capacity in provider capacity ratings **128** are possible.

[0015] Provider population profile **124** as illustrated in **FIG. 2** may further include a provider schedule **130** for care providers in provider list **126**, for instance indicating a provider's availability or expected presence for a given shift for certain hours of the day, or for other times or periods. According to embodiments of the invention in one regard, the workforce management interface **106** may permit a charge nurse or other staff manager to manipulate data, icons and other objects to assign, update, reassign, review and otherwise process a set of provider-to-patient (or patient-to-provider) assignments, in one regard in a visually comprehensible fashion. For example, a staff manager may determine that a patient inpatient list **114** lacks an assigned provider for a shift from 7 a.m. to 3 p.m. for a given day. The manager or other operator may then highlight, grab, click or otherwise activate a provider name in provider list **126**, and drag and drop that identifier onto assignment bar **120** for that patient, or otherwise associate the provider with the patient. In another embodiment, the user may select one or more patients and one or more providers, and initiate an automated assignment process such as the system and method described in the aforementioned U.S. patent application Ser. No. 10/917,337, or others. According to embodiments of the invention in one regard, the assignment bar **120** may automatically change appearance, for instance to be grayed in, to indicate care coverage from 7 a.m. to 3 p.m. Other visual, graphical or other indications or encodings are possible. According to embodiments of the invention in one regard, that assignment may be automatically generated, graphically presented and data such as provider capacity ratings **128** may be automatically updated, upon the registration of a new assignment in that drag and drop or other fashion. Other icons, objects and actions are possible.

[0016] According to embodiments of the invention illustrated in **FIG. 2** in another regard, the workforce management interface **106** may likewise present a staff capacity breakdown **132** to present to the staff manager the total allocation of staff capacity during a given shift or other period in summary fashion, for instance to list providers in a table with their assigned patients and workload allocations. Other views, tabulations or reports are possible.

[0017] According to embodiments of the invention in a further regard, the workforce management interface **106** and associated logic may further monitor or condition patient assignments based on regulatory compliance, clinical best practices or other clinical or operational criteria. Thus for example, and as for example illustrated in **FIG. 3**, the

workforce management interface **106** may monitor for mandatory or other state, federal, industry or other compliance criteria regarding or limiting the acceptable ratio of care providers to patients or requiring staffing based on quantitative levels of acuity. When an attempt is made, for instance by selecting, dragging and dropping a care provider by name to an assignment bar **120** for a patient which would result in that provider's reaching a level of, for example, five (or other) patients for a given shift or period, the workforce management interface **106** may generate and display an alert **134** indicating that exception to a charge nurse or other manager. According to embodiments, in the event of an alert **134** the workforce management interface **106** may present the staff manager (or other user) with options for instance to temporarily accept an assignment to remedy the violation later, to cancel that assignment, to suggest alternative assignments, or take other actions or options. Other regulatory, compliance, clinical, operational, industry or other criteria or guidelines may be used, monitored or accessed to trigger alert **134**.

[**0018**] **FIG. 4** illustrates overall management interface and workforce assignment processing, according to embodiments of the invention. In step **402**, processing may begin. In step **404**, the workforce management interface **106** or other clinical tool, interface, presentation layer or resource may be accessed, initiated or executed, for example by a charge nurse on or by client **102** or other networked or other machine or resource. In step **406**, the charge nurse or other staff manager may access or review the patient population profile **112** to assess or determine the clinical care needs of patients in a unit or other group represented in patient population profile **112**. Those clinical care needs may be or include specialized skill criteria **118** required to service the conditions or carry out the therapies of individual patients, such as for example training on or certification for types of equipment such as ventilators or pumps, electrocardiograms (EKGs), the training or certification to insert and administer intravenous lines, or other qualifications, skills, certifications or capabilities.

[**0019**] Those clinical care needs may likewise include provider coverage or assignment gaps, for instance depicted in assignment bar **120** as a white-colored or other coverage gap **122** indicating, for instance, that an assigned nurse, therapist or other care provider is scheduled to depart early on a given day, leaving four hours starting at noon or other periods of time for that patient uncovered or unassigned. Other care assignments and patient needs are possible.

[**0020**] In step **408**, the staff manager may review the provider population profile **124** to assess and determine available care providers and their projected or estimated capacities, skill sets and other information or qualifications to service the patient population. For instance, a charge nurse or other staff manager may use workforce management interface **106** to access the provider population profile **124** and review provider list **126**, provider capacity ratings **128**, provider schedule **130** and other information to assess the overall complement of provider capacity and capability available for assignment. According to embodiments of the invention in one regard, the provider capacity ratings **128** or other projected or estimated work capacity or production ratings may be generated by or accessed from a capacity

platform such as that described in the aforementioned U.S. patent application Ser. No. 10/679,836, or other platforms, systems or resources.

[**0021**] In step **410**, the staff manager may assess and determine any requirement for specialized care needs, such as for example the assignment of common care providers to a mother and newborn infant. In step **412**, the staff manager may drag and drop or otherwise allocate or activate an assignment of a care provider to one or more patient requiring a care assignment, for instance selecting or highlighting a nurse, therapist, technician or other from provider list **126** and dragging that name or other object on top of a patient name in the patient list **114**. According to embodiments of the invention in one regard, upon acceptance of that selected assignment, the assignment bar **120** and other graphical displays or other information may be updated to reflect the newly assigned provider, and the period of time over which they may be assigned. According to embodiments of the invention in a further regard, the coverage gap **122** may automatically disappear when such an assignment may be made. In other embodiments of the invention, when a patient is selected in step **412**, the system may block off all or part of one or more assignment bars for the staff who are inappropriate based on the patient's rated needs and the provider's rated capacity.

[**0022**] In step **414**, an alert **134** may be generated and displayed on workforce management interface **104** upon the detection or identification of an assignment, attempted assignment or other action causing or leading to violation of compliance, clinical, operational or other criteria or limits, for instance upon detection of a skill set mismatch or other exception, or that the assignment of a nurse would result in a patient assignment total or ratio which would exceed federal, state, industry or other limits or guidelines. In step **416**, the workforce management interface **106** may in the event of an invalid assignment or other exception generate an alternative provider assignment which may remove the exception or other invalid condition.

[**0023**] In step **418**, the workforce management interface **106** may generate and display updated assignment, capacity, schedule and other data reflecting provider assignment updates or changes and other information, for instance via assignment bar **120** or other visual, graphical or other display. In step **420**, the set of provider assignments **132** may be stored to workforce database **108** or other data store or facility, for instance to distribute to the clinical staff, create a record of clinical operations, to serve as a basis for or input to a further set of assignments, or other purposes. In step **422**, processing may repeat, return to a prior processing point, jump to a further processing point or end.

[**0024**] The foregoing description of the invention is illustrative, and modifications in configuration and implementation will occur to persons skilled in the art. For instance, while the invention has generally been described in terms of generating and presenting a workforce management interface **106** which may be hosted on or displayed by a client **102** such as a desktop or laptop computer, in embodiments the workforce management interface **106** may be hosted on, executed by or displayed on other machines or resources, for instance on a network-enabled cellular telephone or digital assistant, a special-purpose workstation, or other hardware or resources.

[0025] Similarly, while the invention has in embodiments been described as involving the tracking and management of patient assignment configurations in a single unit 110 such as a single hospital floor or department, in embodiments the workforce management interface 106 may track, manage and provide a view on other units of operation or multiple units, such as a wing, laboratory, complete floor, or other workforce or workplace section or division, combinations of the same, or multiple or aggregated hospitals or other facilities. Other hardware, software or other resources described as singular may in embodiments be distributed, and similarly in embodiments resources described as distributed may be combined. For instance while the invention has in embodiments been described as storing patient assignment and other data to a single workforce database 108, in embodiments patient data, provider data, patient to provider (or provider to patient) assignment and other data may be stored to single or multiple local, remote, networked or other databases or data stores. The scope of the invention is accordingly intended to be limited only by the following claims.

We claim:

1. A system for generating an interface for managing clinical workforce operations, comprising:

a first interface to receive a patient population profile and a care provider population profile;

a second interface to an assignment engine, the assignment engine receiving the patient population profile and care provider population profile to process care provider-to-patient assignment information; and

a presentation layer, the presentation layer communicating with the assignment engine to generate an interactive display of coverage information for the patient population based on the provider-to-patient assignment information.

2. A system according to claim 1, wherein the care provider population profile comprises a list of care providers and associated care provider schedules, care provider skill sets and care provider capacity ratings.

3. A system according to claim 2, wherein care provider schedule information may be graphically manipulated to satisfy patient population coverage requirements.

4. A system according to claim 3, wherein the graphical manipulation comprises dragging and dropping a care provider identifier object on a patient identifier object.

5. A system according to claim 1, wherein the presentation layer generates an alert upon detection of a coverage exception.

6. A system according to claim 5, wherein the coverage exception comprises at least one of a skill set mismatch, a care provider over capacity condition, and a patient coverage gap.

7. A system according to claim 1, wherein the presentation layer comprises a graphical user interface.

8. A system according to claim 1, wherein the coverage information comprises at least one of aggregate care provider capacity information, expandable assignment views and compliance information.

9. A system according to claim 1, wherein the display of coverage information comprises an assignment bar, the assignment bar representing coverage for a patient over a scheduled period.

10. A system according to claim 9, wherein the assignment bar comprises a coverage gap indicator.

11. A method for generating an interface for managing clinical workforce operations, comprising:

receiving a patient population profile and a care provider population profile;

processing care provider-to-patient assignment information based on the patient population profile and care provider population profile; and

generating an interactive display of coverage information for the patient population based on the care provider-to-patient assignment information.

12. A method according to claim 11, wherein the care provider population profile comprises a list of care providers and associated care provider schedules, care provider skill sets and care provider capacity ratings.

13. A method according to claim 12, further comprising graphically manipulating care provider schedule information to satisfy patient population coverage requirements.

14. A method according to claim 13, wherein the graphically manipulating comprises dragging and dropping a care provider identifier object on a patient identifier object.

15. A method according to claim 11, further comprising generating an alert upon detection of a coverage exception.

16. A method according to claim 15, wherein the coverage exception comprises at least one of a skill set mismatch, a care provider over capacity condition, and a patient coverage gap.

17. A method according to claim 11, wherein the generating a display comprises generating a display via a graphical user interface.

18. A method according to claim 11, wherein the coverage information comprises at least one of aggregate care provider capacity information, expandable assignment views and compliance information.

19. A method according to claim 11, wherein the display of coverage information comprises an assignment bar, the assignment bar representing coverage for a patient over a scheduled period.

20. A method according to claim 19, wherein the assignment bar comprises a coverage gap indicator.

21. An interactive graphical display of clinical coverage information, the interactive graphical display being generated by a method comprising:

receiving a patient population profile and a care provider population profile;

processing care provider-to-patient assignment information based on the patient population profile and care provider population profile; and

generating an interactive display of coverage information for the patient population based on the care provider-to-patient assignment information.

22. An interactive graphical display according to claim 21, wherein the care provider population profile comprises a list of care providers and associated care provider schedules, care provider skill sets and care provider capacity ratings.

23. An interactive graphical display according to claim 22, wherein the method further comprises graphically manipulating the care provider schedule information to satisfy patient population coverage requirements.

24. An interactive graphical display according to claim 23, wherein the graphically manipulating comprises dragging and dropping a care provider identifier object on a patient identifier object.

25. An interactive graphical display according to claim 21, wherein the method further comprises generating an alert upon detection of a coverage exception.

26. An interactive graphical display according to claim 25, wherein the coverage exception comprises at least one of a skill set mismatch, a care provider over capacity condition, and a patient coverage gap.

27. An interactive graphical display according to claim 21, wherein the generating a display comprises generating a display via a graphical user interface.

28. An interactive graphical display according to claim 21, wherein the coverage information comprises at least one of aggregate care provider capacity information, expandable assignment views and compliance information.

29. An interactive graphical display according to claim 21, wherein the display of coverage information comprises an assignment bar, the assignment bar representing coverage for a patient over a scheduled period.

30. An interactive graphical display according to claim 29, wherein the assignment bar comprises a coverage gap indicator.

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