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A work group model for nursing wards

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This chapter consists of four parts. The first part describes a number of problems nursing wards frequently experience in their daily work. Possible causes of these problems are enumerated and placed into the framework of a workgroup model. This model runs as a continuous thread through the remaining parts.

The second part concentrates on the differences between two nursing wards, a surgical and a non-surgical one: differences with regard to general working conditions, organizational structure and problems experienced by the wards. These differences are described in terms of the model. Differences in number and kind of problems appear to be explainable in terms of the model: the better the fit between working conditions and organizational structure, the less the problems experienced by the wards.

The third part presents the results of a survey study set up to corroborate the tentative conclusions of the case studies described in the second part.

The fourth part concentrates on a conflict between at the one hand a number of nursing wards and at the other hand a physiotherapy department. The positions of each of the conflicting parties are analysed in terms of the model and, in addition, the process leading to conflict solution is described. This process starts from the analyses arrived at by means of the model.

SOME TYPICAL PROBLEMS EXPERIENCED BY NURSING WARDS

In our contacts with nursing wards we were struck by the high frequency with which problems and complaints as listed hereafter were mentioned: structural shortage of nursing personnel; large variations in work load (large variations from day to day, but also large variations within a working day: i.e. both over- and under utilization of personnel frequently occurred); less than acceptable quality of patient care (several tasks were regularly neglected;
appointments could frequently not be kept); a great many interruptions of various kinds during day time caused by members of various departments (physicians, physiotherapists, the operating room, other nursing wards, departments for medical examination or treatment) resulting in tasks which had to be broken off in the middle and started again from the beginning; high stress, high absence rates. In their own view, nursing wards were surrounded by lots of trouble makers, intruding at unsuited moments, all making demands on the nurses' time, often at the same time, often incompatible.

Two groups of possible causes

- Regulation of inflow
  Nursing wards, as all work groups, have to do their jobs, which may vary in number and kind, with the help of personnel which may also vary in number and kind (quality). Evidently, nursing wards will be able to do a better job to the degree that the amount and kind of tasks to be executed are better attuned to the number and quality of personnel needed to execute those tasks. The structural shortage of personnel and the large variations in work load mentioned above, strongly suggest that this attuning falls short both for the long and for the short term. Long term attuning concerns fitting the amount of personnel of a ward to the mean workload of the patient inflow. Short term attuning means that in admitting (new) patients notice is taken both of the number of personnel that will be available at the time of admission and of the workload provided by the patients already present in the unit. Short term attuning also means that in accepting daily orders with regard to cure and care of patients (e.g. in making appointments with environmental units) the availability of personnel needed to keep those appointments (e.g. to take care of transport or to prepare patients for medical examination) is taken into account.
  In practice, this is rarely done. Large variations in patient inflow occur together with but unrelated to large variations in personnel inflow. The same is true for the short term attuning of inputs. Consulting physicians and physiotherapists drop in at unpredictable times thereby often causing momentary work overload. In case time schedules are used to regulate inputs or the time of execution of appointments or daily routines, those schedules are most often not coordinated.
Moreover those schedules (e.g. appointment schemes of the operating theatre and other departments for medical treatment or examination) are often untimely changed. The result is extreme variability of work load during day time.

In summary, both long and short term attuning of inputs to one another and the attuning of these inputs to the progress of ongoing work are lacking. Many improvements seem to be possible with regard to this point.

- Internal organization

A second cause of the problems experienced by nursing wards concerns their internal organization. By internal organization we mean the task structure and the decision making structure of a workgroup.

- Task structure. Different nursing tasks (washing, feeding, giving medication, and so on) may be allocated to different nurses on a more or less permanent basis, i.e. nurses perform only a small part of the total number of tasks during the time of their shift. Another possibility is that a few nurses provide total care to a small group of patients. In the latter case nurses are more aware of changes concerning the condition of patients, their special needs and so on. This may be an advantage both from the point of view of quality of patient care and from the point of view of quality of working (nursing) life. To the degree that tasks are interdependent and to the degree that interruptions from environmental departments influence these interdependent tasks (as is the case for many wards), coordination becomes increasingly difficult when different tasks are allocated to different nurses. However, changing conditions can be easily assimilated if a ward has a task structure comparable to that known from primary nursing or team nursing, as is the case for the latter task structure. In that case, it is the same nurse (or the same small group) that both knows about ongoing changes relevant for the tasks to be executed next and is responsible for the execution of those tasks. In addition, such a task structure provides for a far more satisfactory job for the nursing personnel because nurses experience more variety, task identity (doing a whole job), and feedback.

So, many of the short term coordination problems mentioned above could very well result from task structures which imply that nurses are only responsible for a number of isolated tasks. Allocating total care for a number of patients to a group of nurses probably provides for a better task structure.
There is, however, at least one problem to strong patient-nurse linkages, viz. the problem of scale. Smaller groups of nurses taking care of smaller groups of patients will experience a more variable work load. The reason is that the mean work load of a small group will change more when one of its patients is replaced by another compared to the mean work load of a large group. Another reason for creating groups of not too small a size is given by the (sometimes big) differences in age, education and experience between nurses. So, there are at least two ways to adapt the task structure of a nursing ward to the ever changing working conditions imposed by its environment: creating groups that provide for total patient care (or that are at least charged with subsets of interdependent tasks) and creating groups that are large enough to prevent extreme variation of work load between groups.

In practice, however, the task structure most frequently found is a fractional one, different nurses taking care of different parts of the care to be provided, often not knowing if conditions relevant for the execution of their partial tasks have changed. This could very well be one of the causes of lacking quality of care, lacking efficiency (e.g. executing tasks to no effect because of changed conditions), and so on.

- Decision making structure: The decision making structure of a nursing ward (the second part of its internal organization) provides for another possible cause of the problems described above. By decision making structure we mean the way in which the authority to make decisions as to "who is going to do what at which moment in which way" is distributed among members of the ward. In many cases, it is the head nurse who makes all those decisions for the entire ward. She is informed on all ongoing changes, is asked for advice on all kinds of questions and in the end she is completely overloaded by information. She probably makes mistakes; one has to wait to get her advice. In case of routine decisions, decision making could better be delegated to the nurses executing the routine tasks or decisions could better be made only once and formalized by means of fixed instructions. Things would run more smoothly if the head nurse could occupy herself more intensively with long term decision making (e.g. negotiating with the environment in order to attune inputs to one another and to the progress of ongoing work (e.g. keeping watch over work load variations from day to day or work load variations between groups of the ward; keeping watch over quality of care, educational programs, performance appraisal and so on).
Meanwhile, short term decision making within the conditions created by the head nurse for the different groups could be delegated to those groups responsible for the total care of a limited number of patients. The combined effect of a fractionary task structure and either a completely centralized decision making structure (overloaded headnurse) or a completely decentralized decision making structure (each nurse decides for herself what to do next) which are both often found in nursing wards prohibits nurses to communicate intensively on changing conditions, and to take measures accordingly.

So, the decision making structure of a nursing ward could very well be an important cause of low efficiency. Delegation of a well chosen number of decisions to those executing nursing tasks could both improve efficiency and quality of working (nursing) life; the latter because of increased responsibility and autonomy.

A tentative model for the organization of nursing wards

During the course of studying the problems and possible problem causes reviewed above, we came to formulate a model for the organization of nursing wards. Working at this model, we made eclectically use of a number of sociotechnical, job design, and contingency theorie sources (Cherns, 1976; Hackman, 1978; Slocum & Sims, 1980; Susman, 1976; Thompson, 1967, Tushman, 1978; Tushman & Nadler, 1978). The model is to be considered as a framework in which a number of well known principles borrowed from those sources is brought together and applied to the specific context of nursing wards.

The model will be built up gradually in the next few pages. Summary statements can be found in Table I at the end of this section.

The conditions a nursing ward has to cope with can be described in terms of two concepts, viz. uncertainty and complexity. Uncertainty may refer both to variability stemming from the environment of a ward (e.g. variability of patient inflow or personnel inflow) and to unpredictability of progress of ongoing work (e.g. unexpected treatment effects). Complexity refers to the variety of and the interdependencies between the tasks to be executed by the ward.
Uncertainty and complexity both result partly from "deals" between ward and environment. Ward and environment have come to more or less explicit agreements on the number, kind, time and place of delivery of services (by the ward) and on the number, kind time and place of delivery of means (to be provided by the environment) needed to provide those services. The net result of those "agreements" may be a ward working in a stable, predictable, certain environment or a ward working in an unstable, unpredictable, uncertain environment.

If conditions are unstable, a ward has two options. First, it can try to reopen negotiations with the environment to come to new long term "agreements" that result in more stability. Secondly, the ward can try to communicate intensively with the environment in order to bring about as much stability as possible within the limits imposed by the original agreements; in addition, the ward can try to adapt its internal organization to the instability stemming from the interaction with its environment.

An example of the first option is trying to make long term agreements on visiting times with medical specialists (resulting in fixed visiting times). An example of the second option is trying to persuade a medical specialist to make his visit on a given day at a particular time (most suited to the unit) or trying to postpone the admission of a particular patient on a particular day because of momentary lack of personnel or unexpected delay of dismissal of other patients. In line with the second part of the second option, a fractionary task structure should be avoided and if one chooses a team nursing like structure small subgroups should be avoided. In addition to the intensive external communication there should be intensive internal communication on the progress of ongoing work. The regulation of this work ("who is going to do what at which moment") should be delegated to the group executing this work. At the same time this group has to stay in close contact with the person(s) responsible for external communication. In view of the uncertainty stemming from the environment, the ward should make the least possible use of fixed time schedules to regulate daily routine tasks.

If tasks are complex and (or) interdependent, a fractionary task structure is only possible under stable conditions. Under unstable conditions specialization should be minimal.
In case of low uncertainty (which may either stem from very strict long term agreements between ward and environment on patient inflow, personnel inflow and attuning of both to one another, or from rather loose long term agreements within which the environment actually behaves rather stable), there is no need of intensive external communication. The ward can effectively and efficiently operate because in- and outflows are predictable and require only periodically short term adjustments. As to the internal organization, the stable working conditions allow in principle for a rather differentiated (fractionary) task structure and a centralized decision making structure. Differentiation will be necessary only in case of high complexity. Many "who is going to do what at which moment" decisions can be made in advance and need no further revision or adjustment because of stable and predictable circumstances. The time and sequence of daily routines can be regulated once and for all by means of fixed time schedules.

It should be noticed that from the standpoint of quality of nursing life the highly differentiated task structure and highly centralized decision making structure that are in principle possible given low uncertainty, are not necessarily the best option too. The reason is that skill variety, task identity and autonomy which are important determinants of motivation and satisfaction, will probably be low.

The requirements stemming from uncertainty and complexity are summarized in Table 1. The next section will illustrate the prescriptions of the model at the hand of two concrete examples.

[Insert table I about here]

COMPARISON OF TWO WARDS WORKING UNDER DIFFERENT CONDITIONS

In this section, two wards will be described (based on two weeks of participant observation and interviews with leading staff nurses), a ward for internal medicine (a non-surgical ward) and a ward for gynaecological medicine (a surgical ward). The most striking difference between these wards concerns the uncertainty of their workstreams. The internal ward can be characterized by a highly uncertain workstream, whereas the gynaecological ward works under very stable conditions. Therefore, the work group model prescribes a different structure for each ward. In practice, only the structure of the gynaecological ward appears to obey these prescriptions.
In our opinion, the great many problems that appear to occur in the internal ward can, at least partly, be explained by the discrepancy between the ward's actual and prescribed structure.

- The ward for internal diseases

The internal ward (60 beds, all in 47 nurses) works under high uncertainty. Approximately ninety percent of all patient admissions are urgent, which means that at the beginning of each day the number and kind of patients to be admitted are unpredictable (the only upper limit being given by the number of dismissals or empty beds). In addition, the internal ward is dependent on a great many environmental departments for examination and treatment of practically all of its patients (X-ray department, lab, radiotherapy ward, and so on).

With some of these environmental departments appointments can be made; however, the internal ward has to accept day and time assigned by the external department in question. The other environmental departments call for patients at moments most convenient to themselves, and the internal ward has no other choice than promptly respond to their calls, which means instantaneous preparation of patients and arrangement of transportation to the external department. Specialists for internal diseases drop in at unpredictable moments and ask for (immediate) assistance to make their rounds. The same counts for other medical specialists that are asked for advice by the ward's own specialists.

So, the tasks to be executed by the ward can be divided into four groups. First (category 1), there are tasks of which it is unknown at the beginning of a day if they will have to be executed at all during that day. However, when asked for, they will have to be executed immediately (e.g. tasks related to urgent admissions).

Secondly (category 2), tasks of which it is known that they will have to be executed, without the exact time of execution being known. However, these tasks too have to be executed immediately when asked for (e.g. assistance of medical specialists who want to visit their patients).

Thirdly (category 3), tasks of which the point of time of execution is fixed (e.g. giving injections, preparation for a treatment), and of which it is known that they will have to be executed.

Fourthly (category 4), tasks which can (within limits) be executed at times most suited to the nursing personnel (e.g. writing reports, cleaning, making beds, washing and feeding patients), and of which it is known that they will have to be executed.
The first three categories take a relatively large portion of total time needed for the execution of nursing tasks in the internal ward. Therefore, the total amount of time needed for task execution varies from day to day (because of category 1 tasks) and from time to time during the period of a shift (because of category 1, 2 and 3 tasks). In other words, the internal ward has to work under high uncertainty, because, firstly, long term agreements with environmental departments imply that the internal ward has to deliver services immediately on request and, secondly, environmental departments ask for unpredictable amounts of services at unpredictable moments. As stated in the previous section, a ward has two options in such a situation. First, to start negotiations with the environment in order to arrive at more acceptable long term agreements. Secondly, to choose a workgroup structure as flexible as possible in order to assimilate the uncertainty it is confronted with. In terms of the workgroup model this would be a structure of the kind described in Table 1 under 1. Uncertainty being high, as illustrated above, and complexity being high too (the whole repertory of regular nursing tasks occurs in the ward, some groups of tasks being highly interdependent or dependent on the condition of the patients in question), there is a high need for intensive external and internal communication to attune inputs to one another and to the progress of ongoing work; a high need for a task structure consisting of the largest possible groups responsible for total care for groups of patients; a decision making structure which delegates as many decisions regarding task execution as possible to the groups charged with these tasks.

In practice, the structure of the internal ward deviates from the desired characteristics mentioned above in a number of respects. **External communication** is for a large part simply lacking. That is to say, the ward does not regularly consult with medical specialists on patient admissions (consultation could be on the possibility of delay of less urgent admissions in case of lack of personnel or on cancellation of planned admissions in case of a large number of urgent admissions). As far as the ward undertakes attempts to influence the filling in of appointment schedules of departments for medical examination or treatment (so far as those departments schedule clinical patients at all), to bring those appointments in line with available personnel or spread those appointments regularly over the day, these attempts fail. The ward doesn't contact medical specialists in order to agree on a suitable time for their daily visit. The only exception concerns the inflow of personnel.
In case of shortage of personnel, the ward communicates with neighbouring wards or with the assistant head of the nursing department to fill up personnel from the eventual surplus of other wards or from a pool of reserve personnel. Sometimes requests for additional personnel are agreed to, sometimes they are not.

The task structure of the internal ward partly conforms to the prescriptions by the model: the ward is subdivided into four groups of nursing personnel (over day time shifts 6 or 7 persons per group) each responsible for 15 patients (beds). However, within these groups tasks are functionally allocated instead of patient-centered.

At the group level decision making fails: instead of intensive intragroup communication on the progress of work and the assimilation of changing circumstances, each nurse feels only responsible for his or her individual tasks. In addition, no one is explicitly allocated with the tasks belonging to categories 1 and 2, so that execution of these tasks, despite their importance, is dependent on the compliance of who by accident bumps into the request for execution of the task in question. In other words, decision making has been delegated too far to the level of individual nurses, whereas it is in fact the group who is (should be) responsible.

The time of execution of many daily routine tasks is regulated by a more or less fixed program (time schedule). There is some intergroup communication on exchange of personnel in case workload appears to be unevenly distributed over groups.

In summary, the largest discrepancies between actual and prescribed structure bear upon the communication of the ward with different environmental departments, and the kind of task allocation and decision making structure chosen. External communication should be intensified (however, long term "agreements" afford only very small margins for this kind of communication; therefore these long term agreements should be renegotiated) in order to spread workload more evenly over the day and in order to avoid days of work overload. The task structure should be more product (patient) oriented in order to avoid coordination problems. The decision making structure should be more centralized (at the group level) for the same reason.

In our opinion, the problems experienced by the internal ward can be explained by the discrepancies described above. Those problems boil down to capacity problems.

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Because it is practically impossible to predict the workload of a given day or the times of the day at which workload will be highest, nursing personnel often is overloaded. Deficiencies of task and decision making structure only make things worse. No wonder that many complaints are heard on lacking quality of care, lacking continuity of care, dissatisfaction with work in general, and absenteism.

- The gynaecological ward
In many respects, the gynaecological ward (24 beds, all-in 15.5 nurses) is the opposite of the internal ward. Uncertainty is generally rather low. Urgent patient admissions make up no more than 5 percent of total admissions. The remaining 95 percent consists of planned admissions; that is to say that the number, kind and time of arrival of patients are known some time before their actual arrival, which provides at least some opportunity to make arrangements. Nonetheless there is some variability at the demand side, depending on the number and kind of patients asking for admission.

Another factor which decreases the uncertainty and at the same time the complexity of the gynaecological ward's workstream is the fact that medical examinations have taken place already policlinically before patients are admitted. So, the kind of work and the kind of problems related to these examinations as experienced by the internal ward don't exist for the gynaecological ward. The only environmental departments relevant for the gynaecological unit are the operating theatre, the gynaecologists, other medical specialists and the physiotherapists. Orders stemming from the first two (most important) environmental units are for the most part known beforehand which reduces uncertainty to a minimum, because the time schedule of the operating theatre is announced in time and because the gynaecologists always make their visits at the same hour.

So, in the case of this unit, it has apparently been possible to make a number of long term agreements on regulation of inputs which result in a highly predictable workstream. In addition to what has already been said about the ward's low complexity, it can be added that most of the nursing tasks concern pre- and postoperative activities which are to be executed rather routinely in a prescribed order at prescribed times. So variety is rather low but interdependencies between tasks are high.

Summarizing, in terms of the four categories of tasks discerned above:
- the amount of time spent on execution of unexpected orders is very small (category 1);
- the amount of time spent on execution of orders of which number and kind are known, but of which the point of time of execution is unpredictable is very small (category 2);
- the amount of time spent on execution of orders, of which the kind, number and required point of time of execution are known beforehand is large (category 3);
- the amount of time spent on execution of orders, of which kind and number are known beforehand but which have no fixed required point of time of execution is rather large too (category 4).

The prescriptions of the model, given the rather low uncertainty and low variety but high interdependencies of the gynaecological ward's workstream, can be found in Table I under 3.

Because the long term agreements on input inflow do not interfere with one another, there seems to be no need for the ward to renegotiate with its environment on those long term agreements. Because of low uncertainty, there is no need of intensive external and internal communication on the attuning of inputs to one another and to ongoing work. Some communication of this kind will always be necessary however, unless there is total stability. In case of the gynaecological ward, there is some variability in demand for admission. Some mutual consultation will be necessary of gynaecologists, the operating theatre and the gynaecological ward with regard to the matter of which patients will be admitted on which days. Important factors of consideration will be the availability of capacities such as beds, nursing personnel, operating rooms and the like. In practice, a kind of mutual consultation as described here takes place indeed.

The end result is a rather fine attuning of patient inflow to personnel inflow (e.g. heavy operations on days on which extra personnel is available) and a well balanced spread of operations over days of the week, whereby accumulation of pre- or postoperative work is avoided. The low uncertainty and relatively low variety allow for a fractionary task allocation structure. However, a patient oriented task structure is preferable because of the highly interdependent tasks. The high predictability of workload even allows for rather small patient-oriented groups. In practice, neither of these structures is chosen. The unit counts 24 beds and, in fact, there is no task differentiation at all: one group of nurses is taking care of the 24 patients of the unit.
At the beginning of a day, tasks are distributed over personnel in such a way that capacity is available for all tasks that have to be executed at fixed points in time. The rest is allocated by mutual agreement and executed in the remaining time. So decision making is partly centralized and partly decentralized depending on the characteristics of the tasks. Summarizing, there are no real discrepancies between actual and prescribed structure. From the point of view of quality of nursing life a more patient-oriented task structure (which is in principle possible given the main characteristics of the workstream) would be advisable. This lack of discrepancies is in line with the fact that the gynaecological ward hardly reports any problems. The only problems mentioned arise when patients of other medical specialisms have to be admitted. In those cases, the gynaecological ward is, at a very small scale, confronted with the kind of situations which are normal practice for the internal ward.

The tentative explanation presented in this section for the (non)occurrence of a number of problems in two different nursing wards will be further elaborated in the next section which presents data on well over 60 wards.

RESULTS OF A SURVEY OF 64 NURSING UNITS

In the previous section, differences in the amount of problems experienced by two nursing wards were tentatively explained in terms of differential adjustment of the nursing wards' structures to their respective environments. This paper describes the results of a study in which, by means of a questionnaire, data were gathered in 64 wards on (1) the main characteristics of the wards' workstream, (2) the main characteristics of the wards' work group structure and (3) the main problems experienced by the wards with respect to effectiveness, efficiency and quality of nursing life. By applying the prescriptive rules of the work group model it will appear to be possible to score the degree at which each ward's structure is adapted to its main workstream characteristics. This adaptation (fit) score will be related to the amount of problems experienced by the ward.

The elements of the model operationalized.

We will now shortly indicate which kind of information was gathered in order to substantiate the (rather abstract) elements of the model.
In developing the questionnaire, the point of departure was an inventory of nursing tasks (the idea was that these tasks are in fact the services delivered by the ward and asked for by the environment; therefore, interactions with the environment as well as processing of orders have an immediate bearing on these tasks). In total 74 tasks were discerned; 45 of these generally have to be executed as a direct consequence of patient admission (for the most part caring tasks) or as a direct consequence of the treatment prescribed by the medical specialist (for the most part curing tasks); the other 29 refer to activities related to daily transactions with the ward's environment (urgent admissions, orders from environmental departments, supplies from environmental departments).

With regard to each of the latter 29 tasks several questions were asked concerning the predictability of the amount of time to be invested in the task, the predictability of the point of time of execution of the task, the reliability of the environmental department involved in execution of the task. For each question, every ward's position was determined with regard to the median score. Next, in order to arrive at a score for uncertainty, each ward was classified either as a high, a medium or a low uncertainty ward, depending on its total number of below or above median score's per question.

A ward's workstream complexity can among others be derived from the number of tasks indicated as belonging to the normal practice of any working day. Because in this section complexity will be left out of consideration, we will not further elaborate on its operationalization here.

Nursing wards appear to use a number of means to attune inputs to one another and to the progress of daily work. Six different areas were discerned on which wards communicate with their environments and per area 4 or 5 different ways of communication could be indicated (varying in degree of influence the ward can exercise on its environment). The areas are: regular patient planning, personnel planning, planning of operations, planning of examinations and treatments, planning of specialists' visiting times and "planning" of urgent admissions. The scores of each ward on these six areas could be converted into a sumscore indicating the intensity of communication between ward and environment on attuning of inputs to one another and to the progress of ongoing work. These scores too were expressed as below, above or at the median level of all wards taken together.
To determine the flexibility of a ward's task allocation structure, the tasks listed in the task inventory were categorized into three groups (care, cure, and environmental interaction). Per group it was asked if the tasks belonging to that group were exclusively allocated to (some) individual nurses or not. In addition, it was asked if the ward was divided into groups and, if so, what the size of each group was. By combining the answers to these questions it is possible to determine the general kind of differentiation (functionally, patient oriented or mixed) and the degree of differentiation. A task structure flexibility score was derived for each ward. If the answers to the above questions implied that the tasks from the majority of the three groups were functionally allocated this was considered to lower flexibility. In addition, the smaller the subgroups used the lower the flexibility score.

In the same way, a decision making structure flexibility score was determined. This score is higher to the degree that groups have a clearcut (in fact, most of the time rather centralized) regulation center for monitoring and correcting the daily execution of work in the areas mentioned (cure, care, and environmental interaction) and lower to the degree that daily routine work is regulated by fixed time schedules.

An overall flexibility score was arrived at by combining the task and decision making flexibility scores. Each ward was scored either above, or below or at the median overall flexibility level.

Next, for each ward an uncertainty - flexibility fit score was determined. This was done according to the following rules: if both uncertainty and flexibility were high, this resulted in a positive fit score; if uncertainty was low but flexibility high, this resulted in a positive fit score too (the argument being that although not necessary the flexibility could do no harm to an effective and efficient work stream processing); if uncertainty was high, but flexibility low, this resulted in a negative fit score; if uncertainty was high and flexibility intermediate, this resulted in an intermediate fit score; the same kind of reasoning was followed given combinations of intermediate uncertainty and either high, low or intermediate flexibility.
Lastly, for each ward a score was determined on six potential problem areas: effectiveness (7 questions), efficiency (9 questions), quality of nursing life (7 questions) and 3 categories of quality of patient care: tasks related to care (12 questions), tasks related to cure (17 questions) and tasks related to both administration and environmental contacts (13 questions) (in fact these 3 categories overlap with the effectiveness area, questions on the latter however were framed in more general terms).

Per question each ward's position was determined in relation to the wards' median, resulting in a above (+), at (0) or below (-) score. Next, these scores were combined per problem area rather arbitrarily by adding and subtracting plusses and minuses, resulting in scores ranging between minus and plus 8. Lastly, these scores were converted to a series ranging from 17 (extremely high effectiveness, etc.) to 1 (extremely low effectiveness, etc.).

Results

The central thesis of the work group model reads that work groups will do a better job as their structures are better adapted to the main characteristics of their workstream. Therefore, we are first and mostly interested in the eventual existence of a relationship between at the one hand the uncertainty - flexibility-fit scores and at the other hand the scores on each of the six problem areas. To that end, each ward was classified as either low, medium or high on the uncertainty - flexibility-fit dimension (FIT-scale). This resulted in 19 low, 20 medium and 25 high FIT wards. Next, for each group of wards mean scores were determined on each of the six potential problem areas: effectiveness, efficiency, quality of nursing life (QNL), quality of nursing care 1 (QNC1, care tasks), quality of nursing tasks 2 (QNC2, cure tasks) and quality of nursing care 3 (QNC3, administration and environmental contacts). Per problem area differences between mean scores were compared and tested for significance by means of Wilcoxon's T test for ordinal data. The results are shown in Table II.

[Insert Table II about here]

It appears that a lot of the differences between mean scores are both in the direction predicted and significant. For the more generally framed questions on effectiveness, efficiency and quality of nursing life, all of the differences between low, medium and high fit wards are in the direction predicted and significant. For the more specific questions on quality of care, the results are somewhat less satisfying.

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There are no significant differences between the low fit and the medium fit wards on any of the three quality of care variables. However, on all three variables differences between the medium and high fit wards are in the direction predicted and significant.

The main hypothesis is confirmed by still another finding which is illustrated in Table III.

[Insert Table III about here]

Table III presents data similar to those in Table II, the only difference being that nursing wards are classified according to uncertainty instead of according to FIT. It immediately strikes that there is only one significant difference found in this case, which is exactly what would be expected on the basis of chance.

This finding means that uncertainty as such has no effect at all on any of the six potential problem areas. It is the way uncertainty is handled by the nursing wards that determines if there are problems or not. In other words, insofar as there result any problems because of uncertainty (and uncertainty is generally held responsible for the occurrence of problems in nursing wards), these problems result from the fact that the organization structure of nursing units is not adapted to uncertainty, they don't result from the uncertainty as such.

Our tentative conclusion, based on the afore mentioned preliminary analysis of questionnaire data gathered from 64 randomly sampled nursing wards in the Netherlands, reads that the way nursing wards are organized is responsible for problems experienced with regard to effectiveness, efficiency, quality of nursing life and quality of patient care.

A second point concerns the as yet not elaborated factor of intensity of external communication. This factor was not taken into account in deriving a ward's flexibility score. The reason is that the questions on uncertainty measure the actual uncertainty a ward experiences. This uncertainty is the net result of short term interactions of ward and environment which take place within the limits posed by long term agreements. The intensity of communication score therefore refers to activities that precede the uncertainty indicated by the uncertainty score.
The flexibility score indicates the way in which a ward deals with the actual occurring uncertainty. It is interesting to look at the relationship between intensity of communication and uncertainty, because intensive communication is intended to reduce uncertainty (and to the degree it succeeds in doing so a ward can afford to be rigid instead of flexible). Table IV provides some data on this point.

[Insert Table IV about here]

It can be seen from the table that there is at least a weak relationship between communication intensity and uncertainty. Low intensity of communication results into a low chance (20%) on low uncertainty, whereas high intensity apparently doubles chances on low uncertainty (43%). However, medium intensity compared with low intensity does not result into higher chances on low uncertainty.

So, it may be concluded that intensive communication can help to reduce uncertainty. However, it won't reduce uncertainty per definition because the environment's arguments may be better or its position may be stronger. In addition, it should be noticed that our main conclusion that it is FIT that is responsible for the occurrence of problems, not uncertainty as such, should not be interpreted to imply that intensive communication in order to reduce uncertainty would not be wise strategy. There will be limits to flexibility and the higher the uncertainty the greater the chance that these limits will be reached. We hope to be able to shed some light on this problem in the near future on the basis of more detailed analyses of the questionnaire data (included in our sample are wards that combine high uncertainty, high flexibility, but nonetheless rather low quality; these could be examples of wards that can only be helped by reducing uncertainty).

The next section provides an example of an attempt to reduce uncertainty by means of renegotiating long term agreements between nursing wards and their environment.

THE RESOLUTION OF A CONFLICT BETWEEN NURSING WARDS AND THEIR ENVIRONMENT

In one of the hospitals we came across during our study on nursing wards, a long lasting conflict existed between the nursing department and the physiotherapy department. In this section, we'll describe how this conflict was resolved and which role the work group model described in the preceding sections played in resolving the conflict.
Next, the problems at the interface of nursing wards and physiotherapy department will be described and the situation of each of the conflicting parties will be diagnosed in terms of the model. Lastly, the conflict resolution process based on these diagnoses will be outlined.

**Nursing wards, physiotherapy department, problems at interfaces**

In the hospital under study, eight nursing units (about 36 beds each) regularly asked for physiotherapeutic treatment for their patients. The physiotherapy department consisted of 9 therapists (including the head of the unit and his assistant) who provided those treatments. The nursing wards were complaining about:

- The number of physiotherapists visiting each ward; in fact, any therapist could be allocated to the treatment of any patient in any ward. No wonder that all kinds of communication errors frequently occurred. Who is the therapist of this patient? Who has to be informed about changes in the state of the patient? Which therapist forgot to leave instructions for the further treatment of this patient? And so on.

- The unpredictability of the therapists' arrival and the duration of their treatments. Physiotherapeutic treatment was normally given between 10.15 and 12.00 a.m. and between 15.15 and 17.00 p.m. Outside these intervals, the therapists treated policlinic patients. The problem was that nurses never knew at which exact clocktime (within the appointed intervals) a particular therapist would drop in, nor at which time he would leave again. To make things worse, physiotherapists also visited nursing wards outside those intervals, in case they ran out of policlinic patients. The effect of the two factors mentioned was that regular activities of nurses were very frequently interrupted by physiotherapists dropping in, asking for information, asking for their patients, taking patients away for therapy, giving instructions, leaving notes, and so on. Loss of time, irritation, misunderstanding and at last an atmosphere of conflict and antagonism were the result.

Of course, the physiotherapists were complaining too, although far less than the nurses. Their most important problem concerned the

- Availability of patients. Patients were very difficult to find, they could be anywhere except in bed. If in bed, they were often not immediately available for physiotherapeutic treatment because other treatments had to be finished first. The physiotherapists only had two options.
Either wait or start searching for another patient, most often in another ward, where they would probably be confronted with the same problem.

Evidently, the way in which collaboration of nurses and physiotherapists was organized resulted in an enormous loss of time for the physiotherapists and in very frequent work interruptions for the nurses.

Before we came in, there had been a number of unsuccessful attempts to solve the problem. In fact, the nursing department had layed a few claims and the physiotherapists had categorically turned them down.

The claims put in by the nursing department were:
- we only want to deal with one (and the same) physiotherapist per unit;
- we want to know beforehand, at which time a particular patient will get what treatment, so that we can plan our work accordingly.

The answer of the physiotherapists was:
- impossible: we'll lose our skill when we have to confine ourselves to one type of ward, which means one type of patients. Besides, the number of treatments to be given in any particular ward is highly variable. So, the workload of a particular physiotherapist will be extremely high at one day and extremely low at another. Planning is virtually impossible, because you never know how much time a treatment will take. Finally (but never openly stated as an argument) we like our freedom and we won't give it up easily.

So, there was a serious win-lose conflict between the nursing department and the physiotherapy unit. In terms, borrowed from Thompson & Tuden (1959), we had to do with a Type IV problem. That is to say, (1) the structure of the technical problem is not easy to define (there is no clearcut model from which a solution can be derived) and (2) the groups confronted with the problem evidently have different interests. In such circumstances, it can be wise strategy to let each group separately arrive at its own diagnosis of the problem and to confront these diagnoses at a later point in time. So we did, and in diagnosing the problem we made use of the work group model described above.
Diagnosis of the nursing wards' situation

The nursing wards' workstream appeared to be highly uncertain: for many wards, patient inflow was highly variable and very badly attuned to person­nel inflow; the operating theatre, departments for medical examination and treatment (among which the physiotherapy ward), medical specialists and neighbouring wards were responsible for many unpredictable interruptions. Nursing wards literally felt like puppets, connected by means of threads to a great number of environmental departments, sometimes torn to pieces when all pulled at the same time.

This high uncertainty, mainly caused by unworkable long term agreements, required intensive external and internal communication. External communication was lacking, or, in as far as wards attempted to influence the decisions made by the environment, those attempts failed because of unwillingness to concede at the other side. Internal communication was rather intense. It concerned for the most part reallocation of personnel from one (momentarily overstaffed) group to another (momentarily understaffed) group. However, this exchange of personnel occurred more frequently than necessary (in principle), because all wards had a task allocation structure which consisted of three, in view of the prevailing uncertainty too small groups (12 beds each and on the average 1.8 nurses per group). Instead of operating as one or at the utmost two large groups of multi-skilled personnel that can be flexibly allocated to all kinds of tasks that can arise at any moment, wards were rigidly subdivided into three groups which were at times (because of lack of qualified personnel) staffed with student nurses only. Decision making with regard to work processing at the level of these groups was righteously delegated to the nurses making up each group. However, the margins for making decisions were small.

Diagnosis of the physiotherapy department's situation

The physiotherapy department had one main problem: large amounts of time were unproductively spent on walking to and from the eight nursing wards searching for patients available for treatment. A second problem of which the department wasn't aware consisted in a workload unequally divided over therapists.

Confining ourselves to hospital patients, the environment of the physio­therapy department consisted of eight nursing wards situated at rather dis­persed locations (some in a new building, some in an old one).
Requests for physiotherapeutic treatment from each of these eight wards varied in number and kind. As we saw before, availability of patients for treatment appeared to be rather unpredictable, because patients frequently were out of their wards for various reasons. Taken together, the environmental uncertainty of the physiotherapy department was rather high. To handle this uncertainty requires:

- Intensive external communication (e.g. with nursing wards on patient availability); this external communication was lacking.
- Intensive internal communication on task allocation, taking into consideration each therapist's progress of order execution. This communication was lacking too. Tasks were centrally allocated by the assistant head of the unit and next executed by individual therapists in any order they liked without progress being fed back to the assistant head or to one another.
- The less differentiation of task structure as possible. This requirement was fully met, there wasn't any differentiation at all: each therapist could be allocated with the task of treating any patient in any ward.
- A centralized decision making structure. Because of the prevailing undifferentiated task structure this requirement coincides with the second one mentioned (intensive internal communication). That requirement was not met because every therapist decided on his own the order in which he would treat his patients and how much time he would spend on each treatment. Any (necessarily central) coordination between therapists was lacking.

With regard to the complexity of the physiotherapists' workstream, the dispersion of the eight nursing wards over the entire hospital was a case in point. Although this dispersion didn't contribute to complexity qualitatively, it most certainly increased complexity in a quantitative sense: in order to execute their tasks (to deliver their services) physiotherapists had to spread out into all possible directions, thereby losing contact with their base and with one another. This complexity asks for a subdivision of the department into subgroups responsible for different sections of the environment, each section being composed of a number of neighbouring nursing wards.

What we see here is an interesting phenomenon. There are two opposing forces working onto the department. One (uncertainty) saying: stay flexible, no specialization, you can't handle inflow variability if you specialize too much.

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The other one (complexity) saying: split up into different subgroups, a single therapist can't handle all those different locations all by himself. Evidently, the uncertainty force won. Unfortunately, the department did not succeed in finding an optimal solution, doing both forces justice.

The discrepancies described above between actual and prescribed work group structure were, in our opinion, responsible both for the search time problem and for the workload problem (some therapists working harder because their patients turned out to require more treatment time). Both problems were not brought to our attention by the physiotherapists themselves; they enjoyed the luxury of a rather large overcapacity. However both problems would undoubtedly become acute as soon as overcapacity would disappear as a consequence of economizing on personnel.

From confrontation of diagnoses to solution of the problem

The results of both analyses discussed above were used as starting point for a problem solving group consisting of representatives from the nursing department and the physiotherapy department. This group was instructed to generate solutions for the problems at the interfaces of nursing wards and physiotherapy department. However, the problem solving group had to stay within the range of possible solutions defined by the problem-analyses based on the work group model and described above. Interesting discussions were observed in the problem solving group.

Representatives of the nursing department brought to bear arguments like: "Aha, you physiotherapists are responsible for our environmental uncertainty (as we told you many times before in our own words). Our environmental uncertainty has to be reduced in order to enable us to provide for adequate patient care".

The immediate reply of the physiotherapy delegation ran as follows: "Your work group structure is far too rigid. If you leave that subunit structure and make yourself more flexible you can handle your environmental uncertainty. So leave us alone".

"Now look", the nurses said, "you can solve your own problems and some of ours at the same time by changing your work group structure; so split up your group into a number of subgroups and let each subgroup be responsible for the treatments in some of our wards. Besides, you cannot ask us to be more flexible, because adequate patient care requires small groups of nursing personnel responsible for small groups of patients."
So, our work group structure has to be somewhat rigid. And you can enable us to be that rigid by reducing our environmental uncertainty". And so on.

It became abundantly clear that

(1) the nurses had a problem and the physiotherapists had none;
(2) the problem of the nurses could - partially - be solved by the physiotherapists;
(3) the physiotherapists would lose part of their freedom by conceding the requests of the nursing wards and, in the short run, they wouldn't win anything of value to themselves;
(4) the choice between the alternatives "reduction of the environmental uncertainty of the nursing wards" and "making the nursing wards' work group structure more flexible" couldn't possibly be made at the level of the two parties involved; it is the managing directors' responsibility to make clear statements on the goals and missions of the hospital organization. To clarify this point, if quality of patient care is a central goal of the organization and if quality of patient care is interpreted as taking care of interdependencies between tasks executed on the same patient, a nursing unit should be allowed to split up into small groups, each responsible for the total care for a small group of patients. In terms of the model, it is complexity (number of and interdependencies between tasks) that asks for a subdivision of the ward. However, such a subdivision would not put up with the environmental uncertainty of the ward. Therefore, this uncertainty should be reduced, if possible. Otherwise, patient care standards should be lowered.

The problem solving group rapidly discovered that it would never be able to contrive a solution acceptable for both parties and, therefore, the problem was brought to the attention of the board of directors. Happily enough, the board recognized its responsibility and did its duty. It decided in favour of high patient care standards and urged the physiotherapy department to split up into two groups. This instruction was worked out by the problem solving group. Each of the physiotherapy groups would be responsible for half of the nursing wards during a period of three months, thereby reducing the environmental uncertainty of the nursing wards. After that period, groups would interchange wards in order to prevent loss of skill. In addition, in each group of therapists one of the therapists was appointed to coordinate activities within his group in order to intensify external and internal communication.
All nursing wards would provide him with information on required treatments, patient-availability, and so on, and they would get a rough workplanning in return. Information on treatment progress would be filled in on a special form to be attached to each patient's file.

The new structure and work procedures were implemented more than a year ago. They turned out to be a success.

Epilogue

We would like to make a few concluding comments on the results of the project reported on in the preceding sections.

The model presented in this chapter seems to be a helpful instrument for practitioners searching after causes of problems experienced by nursing wards. Helpful in that it provides for a limited number of concepts by means of which the often complex situations of nursing wards can be described in a both systematic and solution oriented way. In addition, problem causes and solutions provided for by the model are of a structural kind. This is advantageous too because very often problem causes tend to be attributed to the behavior or mentality of persons rather than to the conditions that make persons behave as they do. So, one of the model's main functions could very well lie in its providing for objective structural descriptions which by their objectivity are an acceptable point of departure for negotiating parties. However, the case presented in the last section clearly demonstrates that such descriptions alone are not always sufficient. Nonetheless they can be very helpful in getting the finger at the right sore spots.

As will have been noticed by the reader, the model is not to be considered a book of recipes. Its concepts are of a rather general nature and they cannot be applied blindfolded. In the case of the gynaecological ward e.g., it appeared necessary to distinguish between two elements of complexity, viz. variety and interdependency, and to apply normative prescriptions accordingly. Such scrutiny will always be necessary.

Although the results of the survey study reported on seem to support the model's main premises, one should realize that we have gathered up till now only rather qualitative data, viz. the impressions of respondents with regard to the main elements of the model as measured by a questionnaire. Data of a more objective kind are badly needed.
An important problem concerns the definition of "fit", i.e. the kind of correspondence required between workstream characteristics and characteristics of the structure of nursing wards. We have taken the position that "flexibility can do no harm" and therefore our "high fit" group consists both of wards that can be characterized by low uncertainty and high flexibility and of wards with a highly flexible structure that work under high uncertainty. Schoonhoven (1981) presents evidence on the effectiveness of operating room suites from which it appears that flexibility can do harm. Until we have analyzed our data more thoroughly, we cannot be sure if we can maintain our position. Our "high fit" group could very well consist of a number of subgroups with highly different score's on the dependent variables. In fact, Table III points into that direction. The low uncertainty group (n=18) from Table III consists by definition of high fit wards. So, the high fit group from Table III (n=25) must consist of these same 18 wards plus another 7. In order to increase the score's of the low uncertainty group from Table III to the level of the high fit group of Table II, those 7 wards, notwithstanding the fact that they are of equal high fit, must have much higher score's on the dependent variables than the low uncertainty group. Now, there are two interpretations of the probably large variance of the high fit group. The first one is that Schoonhoven (1981) is right, so that some of our high fit groups (those with low uncertainty and high flexibility) are in fact less effective, the reason being that flexibility can do harm if there is no need to be flexible.

The second possibility (Kuipers, personal communication) concurs with our remark on the subjective nature of the data gathered. It reads that the awareness of working in a flexible structure under high uncertainty causes an impression of being highly effective, which impression is then translated into high score's on effectiveness. Working under low uncertainty either in a rigid or in a flexible structure, however, does not bring about the impression of doing a great job, although the job done is, in fact, equally effective. The impression of doing just a normal job under normal circumstances is then translated into average effectiveness score's.

Which one of the two interpretations is the right one cannot be decided on the basis of our subjective data. However, the answer is important, because it bears upon the consequences of reorganizations of nursing wards' structures.


Table I. Elements of a work group model for nursing units: prescriptions for different combinations of uncertainty and complexity.

<table>
<thead>
<tr>
<th>Characteristics of Workstream</th>
<th>Characteristics of prescribed organization structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. High uncertainty and high complexity:</td>
<td>1.1. External and Internal Communication:</td>
</tr>
<tr>
<td>- uncertain inflow of patients, personnel, physicians;</td>
<td>- frequent and intensive, in order to attune inputs to one another and to the progress of ongoing work;</td>
</tr>
<tr>
<td>- uncertain appointments;</td>
<td>- long term agreements should provide for the opportunity to communicate intensively;</td>
</tr>
<tr>
<td>- unpredictable progress of ongoing work;</td>
<td>- the less communicators the better;</td>
</tr>
<tr>
<td>- a large variety of tasks;</td>
<td>1.2. Task Structure:</td>
</tr>
<tr>
<td>- high interdependencies between tasks;</td>
<td>- no fractionary (task oriented) structure allowed;</td>
</tr>
<tr>
<td></td>
<td>- subgroups responsible for execution of interdependent tasks should be as large as possible;</td>
</tr>
<tr>
<td>2. High uncertainty and low complexity:</td>
<td>1.3. Decision Making Structure:</td>
</tr>
<tr>
<td>Uncertainty: see under 1</td>
<td>- delegation of &quot;who, what, when&quot;-decisions (within limits set by the results of external and internal communication) to the groups responsible for task execution;</td>
</tr>
<tr>
<td>complexity:</td>
<td>- no rigid time schedule to regulate every day routine work;</td>
</tr>
<tr>
<td>- no large variety of tasks;</td>
<td>[ ]</td>
</tr>
<tr>
<td>- little or no interdependencies between tasks;</td>
<td></td>
</tr>
<tr>
<td>Characteristics of Workstream</td>
<td>Characteristics of prescribed organization structure</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-----------------------------------------------------</td>
</tr>
<tr>
<td><strong>3. Low uncertainty and high complexity</strong></td>
<td><strong>3.1. External and Internal Communication:</strong></td>
</tr>
<tr>
<td>uncertainty: - predictable inflow of patients, personnel, physicians; - fixed appointments; - predictable progress of ongoing work;</td>
<td>periodical exchange of information suffices if long term agreements provide in principle for the attuning of patient and personnel inflow;</td>
</tr>
<tr>
<td>complexity: see under 1.</td>
<td><strong>3.2. Task Structure:</strong></td>
</tr>
<tr>
<td></td>
<td>- a fractionary structure is allowed, but patient oriented groups are preferred; there is no need for these groups to be of the largest possible size;</td>
</tr>
<tr>
<td><strong>4. Low uncertainty and low complexity:</strong></td>
<td><strong>3.3. Decision Making Structure:</strong></td>
</tr>
<tr>
<td>uncertainty: see under 3.</td>
<td>- centralized decision making is allowed;</td>
</tr>
<tr>
<td>complexity: see under 2.</td>
<td>- fixed time schedules and formalization of procedures are allowed;</td>
</tr>
<tr>
<td></td>
<td><strong>4.1. External and Internal Communication:</strong></td>
</tr>
<tr>
<td></td>
<td>See under 3.1.</td>
</tr>
<tr>
<td></td>
<td><strong>4.2. Task Structure:</strong></td>
</tr>
<tr>
<td></td>
<td>- either a fractionary (task oriented) structure or a structure of patient oriented groups;</td>
</tr>
<tr>
<td></td>
<td><strong>4.3. Decision Making Structure:</strong></td>
</tr>
<tr>
<td></td>
<td>See under 3.3.</td>
</tr>
</tbody>
</table>
Table II. Mean scores on six potential problem areas for three groups of nursing wards varying in quality of fit between uncertainty of workstream and flexibility of work group structure.

Mean scores on:

<table>
<thead>
<tr>
<th>FIT</th>
<th>Effect.*</th>
<th>Effic.</th>
<th>QNL</th>
<th>QPC1</th>
<th>QPC2</th>
<th>QPC3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: low</td>
<td>6.47**</td>
<td>7.11</td>
<td>7.89</td>
<td>8.21</td>
<td>8.47</td>
<td>8.26</td>
</tr>
<tr>
<td>(n=19)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2: medium</td>
<td>8.15</td>
<td>8.70</td>
<td>8.35</td>
<td>7.75</td>
<td>7.95</td>
<td>8.85</td>
</tr>
<tr>
<td>(n=20)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3: high</td>
<td>11.00</td>
<td>10.64</td>
<td>10.76</td>
<td>9.56</td>
<td>10.08</td>
<td>10.88</td>
</tr>
<tr>
<td>(n=25)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

p***
1-3  <.0001 <.0001 <.01 ns ns <.05
2-3  <.001 <.01 <.01 <.05 <.005 <.05
1-2  <.05  <.05 <.05 ns ns ns

* Abbreviations stand for: effectiveness, efficiency, quality of nursing life and quality of patient care.

** Low mean scores represent a worse performance, high mean scores represent a better performance on the domain in question.

*** Level of significance for comparisons between low FIT and high FIT (1-3), medium FIT and high FIT (2-3) and low FIT and medium FIT (1-2); ns = non significant difference.
Table III. Mean scores on six potential problem areas for three groups of nursing wards varying in amount of environmental uncertainty.

<table>
<thead>
<tr>
<th>Uncertainty Effect</th>
<th>Effic.</th>
<th>QNL</th>
<th>QPC1</th>
<th>QPC2</th>
<th>QPC3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: low (n=18)</td>
<td>9.50</td>
<td>10.50</td>
<td>7.50</td>
<td>8.33</td>
<td>9.33</td>
</tr>
<tr>
<td>2: medium (n=24)</td>
<td>8.41</td>
<td>8.54</td>
<td>9.25</td>
<td>9.16</td>
<td>9.83</td>
</tr>
<tr>
<td>3: high (n=22)</td>
<td>8.54</td>
<td>8.86</td>
<td>8.77</td>
<td>8.72</td>
<td>9.18</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>n</th>
<th>1-3</th>
<th>1-2</th>
<th>2-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>ns</td>
<td>ns</td>
<td>&lt;.05</td>
<td>ns</td>
</tr>
<tr>
<td>ns</td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
</tr>
<tr>
<td>ns</td>
<td>ns</td>
<td>ns</td>
<td>ns</td>
</tr>
</tbody>
</table>
Table IV. Relationship between intensity of communication and resulting uncertainty.

<table>
<thead>
<tr>
<th>Intensity of communication</th>
<th>Uncertainty</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>low (n=18)</td>
</tr>
<tr>
<td>low</td>
<td>4 (20%)</td>
</tr>
<tr>
<td>medium</td>
<td>4 (19%)</td>
</tr>
<tr>
<td>high</td>
<td>10 (43%)</td>
</tr>
</tbody>
</table>