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Dynamics of Caseworker Turnover and Clinical Knowledge

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An embryonic theory of managing clinical knowledge is introduced along with a corresponding simulation model. The theory describes the relationship of caseworker turnover to clinical knowledge in mental health services. The simulation model expresses the theory, which represents the dynamic structure governing rates of turnover in community mental health centers. The model demonstrates the feedback between individual caseworkers’ knowledge, the growth (or reduction) in the available knowledge in the organization, and the effect of caseworkers leaving the organization. We suggest that turnover among caseworkers is a key variable in governing agency levels of knowledge. Results demonstrate the theoretical connection between knowledge and turnover, and that this connection has important policy and management ramifications. We conclude that system dynamics modeling has strong potential to help managers of community mental health agencies improve agency outcomes.

KEYWORDS system dynamics, employee turnover, clinical knowledge, community mental health services

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INTRODUCTION

The purpose of this paper is to highlight the critical importance of clinical knowledge in community mental health centers (CMHC). This is accomplished by introducing an embryonic theory of managing clinical knowledge by demonstrating the relationship between caseworker turnover, clinical knowledge, and learning. The theory is expressed through a system dynamics simulation model. This model explicitly represents the dynamic structure governing the relationship between rates of turnover in CMHCs, agency levels of clinical knowledge, and learning.

This study implies that the effectiveness of CMHCs depends on not just the number of caseworkers needed to meet environmental demands, but also on caseworkers possessing sufficient knowledge to deliver quality services. Furthermore, clinical knowledge learned on the job by caseworkers is vital to providing high-quality service delivery. This makes high turnover among caseworkers in community mental health centers a potentially egregious problem with serious implications for agency levels of knowledge and learning. The model developed in this study is used to test hypotheses about caseworker tenure or the amount of time caseworkers remain with an agency, about agency growth or how to hire new workers, and about hiring inexperienced or experienced caseworkers.

Learning and Knowledge Building

Learning and knowledge building in an organization can be described as a model building process (Vennix, 1996). Knowledge is built and shared through innovative, “improvisational group processes” (Sawyer, 2006). The field of system dynamics offers a perspective and method for describing the complex dynamics of organizational behavior (Homer & Hirsch, 2006). System dynamics practitioners view causality as circular as opposed to as a sequence of linear relations. This perspective maps closely onto social systems such as CMHCs where causality moves in both directions. System dynamics modeling facilitates an understanding of how systems evolve over time, and does so using pictorial devices to demonstrate the interrelationships between variables and the behavior of a system (Robards & Gillespie, 2000). This perspective is highly consistent with the historical social work view on human ecology (Bronfenbrenner, 1977).

An additional benefit of system dynamics is that simulation models can be used to test points of intervention. Interventions found to be successful are sometimes referred to as “leverage points” (Senge, 1990), which are actions that agencies can take to improve service delivery or outcomes. There has been recent interest in applying a system dynamic view to mental health services research (Allred, Burns, & Phillips, 2005), but we believe this is the first paper to present an empirical system dynamic model and theory in this
field. We agree with Allred and colleagues that system dynamics modeling is a powerful management tool for CMHCs.

This paper is organized in five sections. First, theoretical ideas about turnover and clinical knowledge are drawn from the literature. Second, the methods used in this study are described. This includes a discussion of system dynamics simulation modeling. System dynamics modeling is widespread in ecology, business, and public health, but not yet in mental health services. Third, the system dynamics model is described. Fourth, the results from several experiments are reported. These results support certain assumptions in the literature and also demonstrate new findings particular to the relationship between turnover and agency knowledge. Finally, we discuss implications from this research, pose questions for future research, and conclude that system dynamics modeling is a useful perspective and tool for helping CMHC managers improve service delivery.

THEORY

To describe the hiring and leaving of CMHC caseworkers and the way that these changes affect an agency’s level of clinical knowledge requires an account of the structure governing the workflow process. The workflow process provides the point of departure for developing our theory of caseworker turnover and agency clinical knowledge. This process includes the various stages of caseworker practice throughout their tenure with the agency, the rates at which caseworkers are hired and leave the agency, and the levels of agency knowledge that rise and fall as caseworkers come and go over the course of time. Key concepts and assumptions have been published in the literature. The following two subsections briefly summarize the main ideas and assumptions from the literatures on employee turnover and clinical knowledge.

Turnover

Employees leave agencies for different reasons, usually voluntarily but sometimes involuntarily. Turnover research has concentrated on voluntary turnover because the focus has been on trying to understand why employees quit. But from an organizational perspective, the consequences of an employee leaving are essentially the same whether voluntary or involuntary. Job announcements must be posted, interviews with potential replacements must be conducted, decisions about who to hire must be made, orientation and training sessions must be offered to those hired, and new hires must be socialized into agency culture. These activities absorb staff time and energy, and thus deflect from delivering services.
Employee turnover can be beneficial or detrimental to the functioning of CMHCs. Sometimes turnover increases agency productivity, due to losing employees that failed to fit into agency culture (Albanese & van Fleet, 1985). Additionally, Carley (1992) points out that organizations may also benefit when new employees bring previously learned knowledge and experience into their new work situation. New knowledge can increase productivity by stimulating synergy among new and tenured workers (Nutley & Davies, 2001). Unfortunately, CMHCs may not benefit from turnover in this way because generally they hire recent graduates or relatively inexperienced caseworkers. It is not yet known whether there is an optimal rate of turnover for CMHCs.

High rates of turnover among direct service workers has become an accepted fact in CMHCs. Barak, Nissly and Levin (2001) found that in human service organizations recent studies report turnover rates of 30% to 60% per year. Turnover tends to be particularly high in mental health and human service agencies (Howard & Gould, 2000) where annual rates often exceed 25% (Gallon, Gabriel & Knudsen, 2003) and can exceed 50% (Glisson & James, 2002). Because caseworkers frequently leave public agencies for positions in the private sector, the public agencies may be considered de facto training grounds for private-practice organizations. This problem is exacerbated by the overall shortage of qualified clinical service workers in the public sector, particularly in rural areas (National Alliance on Mental Illness, 2006).

The research on turnover has been limited by the use of linear correlation models. Linear correlation models are poor at representing feedback processes. According to Forrester (1990), “a feedback system controls action based on the results from previous action” (p. 1–5). Glisson and James (2002) point out that feedback is inherent in service systems. In other words, not only does the work environment affect workers, but the workers also affect the work environment. And more recently, Allred and colleagues (2005) emphasized the importance of using systems thinking in managing the complex process of “sense making” in mental health services. Therefore, modeling feedback systems—such as the interrelationship between caseworker turnover and clinical knowledge—requires non-linear methods to represent this change over time (Philippe & Mansi, 1998).

Turnover of caseworkers creates two problems for CMHCs. First, it is disruptive for the clinical process. Therapeutic alliances between client and clinician are related to positive outcomes in therapy for adults (Martin, Garske, & Davis, 2000) and with children and youth (Bickman et al., 2004; Shirk & Karver, 2003). For this reason, provider discontinuity is a problem (Albizu-García, Ríos, Juarbe, & Alegría, 2004). Connor and colleagues (2003) found that staff with the most direct client contact had the highest job instability. Therefore, those who have a low level of job stability often serve clients who need a high level of provider stability. The second problem created by caseworker
turnover is that when experienced caseworkers leave the agency, they take the knowledge acquired on the job with them. Also, departing caseworkers disrupt the knowledge exchange process.

Clinical Knowledge and Organizational Learning

The process of gaining the knowledge and experience required to perform a job has been described as the learning curve (Argote & Epple, 1990). Services that involve a significant degree of customization and personal interaction require on-the-job learning (Oliva & Sterman, 2001). Clinical caseworkers develop the complex knowledge and skills necessary to perform their jobs through this process, through interaction with clients as well as knowledgeable and skillful colleagues. This learning influences the thinking and behavior necessary to provide high-quality clinical case management.

Most new clinical caseworkers hired by CMHCs have only recently obtained a bachelor’s or graduate degree. Their training programs contain elements of psychological theories and intervention models, and also include some of the many effective treatments for mental disorders that have been empirically validated in randomized clinical trials (Kendall, 1998; Nathan & Gorman, 1998). However, mental health treatment is highly dependent upon personal relationships, such as developing quality alliances with clients and their families (Glisson, 2002) and with other treatment team members (Allred et al., 2005). As a consequence, variability in practice and ambiguity in treatments and their effects leave questions about the effectiveness of “best practices” (Bickman, 2005; Rosenheck, 2001). Therefore, the lack of direct practice experience by new caseworkers creates a delay in clinical effectiveness because of needing to learn on the job the complex skills necessary to do the job well (Kransdorff, 1997).

The complexity of the skills needed by mental health care workers is reflected in the policies of the two major professional groups, professional counselors, and clinical social workers. In most U.S. states, Washington, DC, and Puerto Rico, as well as in most Canadian provinces, applicants for state licensure are required to complete a minimum of 3,000 hours of professional service over a two-year period under the direction of an approved licensed supervisor (American Counseling Association, 2005; Association of Social Work Boards, 2005). This two-year period, therefore, represents the minimum amount of time generally recognized for a clinician to gain proficiency in clinical skills.

While it is assumed that one gains knowledge and therefore effectiveness over time, this relationship is neither simple nor clear. Bickman (1999) refers to this as the “practice makes perfect” myth. Experience alone does not necessarily lead to better clinical judgment (Aegisdottir et al., 2006; Garb, 1989; Garb & Grove, 2005). In contrast to simply the passage of time, experience is translated into improved client outcomes when it is accompanied
Dynamics of Caseworker Turnover

by carefully measured feedback about outcomes and other process elements of the counseling relationship (Bickman, 1999, 2005). Systematizing this feedback process is behind efforts to develop standardized practices in community mental health (Ware, Tugenberg, Dickey, & McHorney, 1999). While time is not the only factor in their development, it does take time to go through the learning-feedback process, and during this time the mutual interaction among colleagues disseminates so that what individuals are learning becomes organizational knowledge. We refer to this dimension of organizational knowledge as clinical knowledge.

Clinical knowledge can be thought of as accumulated and stored information, which flows from person to person producing learning within the organization, or organizational learning (Kyriakopoulos & de Ruyter, 2004). For the relationship between knowledge and learning—metaphorically speaking—knowledge is like water in a reservoir, which can only be used by each individual when it flows through a system of pipes. Building organizational knowledge through organizational learning is a social phenomenon dependent on frequent exchanges of information among colleagues (Simon, 1991), sometimes referred to as intraorganizational networks (Tsai, 2001). These exchanges include both information processing and knowledge creation (Nair, 2001). Organizations that stress innovation and learning may increase service quality (Latting et al., 2004). Our assumption is that a work environment rich in clinical knowledge would stimulate a greater degree of learning. A major gap in the literature is how employee tenure affects the development of clinical knowledge.

INTRODUCTION OF A DYNAMIC MODEL

The theoretical ideas about how turnover and clinical knowledge play out in the workplace were specified as a system dynamics simulation model. This model expresses a theory about how caseworker turnover and clinical knowledge interrelate over time. The model made it possible to examine the effects from turnover (Henggeler, Lee, & Burns, 2002) on the levels of clinical knowledge over time (Rogers, 1976). This work helps to clarify assumptions made in the study of turnover and clinical knowledge and offers preliminary evidence on the consequences of turnover for agency clinical knowledge.

METHODS

We used a case study design. The case study design is well suited for developing theory. The theory is described and tested through a simulation model. In this section, we describe the type of model created, the data used, the setting of the CMHC, the caseworkers employed and the agency's
annual average turnover rate, and the steps taken for protection of human subjects.

System Dynamics Modeling

Creating a system dynamics model is an iterative process incorporating input from key informants of the system modeled. In this respect, system dynamics modeling fits into the well-established traditions of action research (Argyris, Putnam, & Smith, 1985) and community-based participatory research (Minkler & Wallerstein, 2003; O’Fallon, Tyson, & Deary, 2000). Group model building (Vennix, 1996) is one application of these methods. The active involvement of informants in the creation of the model helps validate the elements and assumptions operating in the system and increases the likelihood of useful results. Excellent introductions to system dynamics modeling may be found in Ford (1999) and Sterman (2000).

In system dynamics, stock and flow diagrams represent a common step toward constructing a simulation model. The basic elements of stock and flow diagrams are called “stocks,” “flows,” and “connectors.” Stocks (state variables) represent anything that accumulates. The classic example is the amount of water in a bathtub. Flows (rate variables) control the amount of change over time. In a bathtub, this is the water flowing in or draining out. Every stock has one or more flows attached to it. The content of a stock can change only through the action of its flows. Flows are activated by connectors. Connectors are arrows that carry information about the level of a stock to the flow of that stock or the flows of other stocks. In drawing a bath, the faucet is turned on until the desired level of water has accumulated, at which point feedback from the stock through the connector results in the faucet being turned off. Combinations of these elements—stocks, flows, and connectors—describe how the structure of a system drives its behavior.

Data Sources

Three data sources informed model construction. First, we drew from the literature assumptions regarding the acquisition and distribution of clinical knowledge. Second, we interviewed key informants. This included five caseworkers and the vice president of human resources and outpatient services (VP). These key informants described how the community mental health agency system worked. They described the hiring process, agency orientation, training, and state and local regulations and requirements governing the provision of services. These informants also explained how the agency perceived and responded to employee turnover among caseworkers. The third source of data was employee dates of hire and termination for the years 2002–2005. These data were drawn from agency records and provided the necessary information to establish the agency’s baseline rate of turnover.
Setting

The model was developed through cooperation with a CMHC in the Midwestern part of the United States. The organization is an administrative agent for the state’s Department of Mental Health. This agency is contracted to provide clinical services to residents of four geographically large counties. Although two of the counties served by the CMHC are rural, they are roughly contiguous to the largest metropolitan area in the state, with a population density of 1,941 persons/mi² (Missouri Census Data Center, 2005). The close proximity to a large metropolitan area gives the agency access to graduate-level, university-educated workers from five universities in the region. These schools have accredited graduate programs in either professional counseling or social work, and two other programs that have regionally but not nationally accredited counseling programs. However, the low density of the population over the large, rural geographic area can lead to difficulty in finding replacement caseworkers; those living in the urban area must drive a considerable distance to get from home to work.

The agency has implemented several ways of dealing with the turnover problems. These include a formalized orientation process, incentive-based pay, flexible schedules, mental health/team building days, and better communication. The agency reports that these changes have had a positive impact on turnover.

Caseworkers

At the time of this study, the agency employed 60 clinical caseworkers whose positions require a master’s degree in social work, psychology, or counseling. These caseworkers provide services such as psychosocial assessments and referral; prevention and treatment; crisis intervention; rehabilitation; community support; and case management for adults, adolescents and children. They are salaried employees who work in one of three administrative categories: 1) community- and school-based children’s services, 2) community-based adult services, or 3) office-based services. Their tenure with the agency is about the same across these three divisions. According to agency reports, the mean tenure of clinical caseworkers is 75 weeks with a standard deviation of 56 (this excludes thirteen outlier employees who have been with the agency for over 212 weeks). For the clinical caseworkers of this agency, this works out to be an average annual turnover rate of approximately 25%.

MODEL COMPOSITION

The model is a modified cascaded levels structure (see Hines, 2005) representing the baseline composition of a CMHC workforce in equilibrium.
Being in equilibrium means that the inflows and outflows of the model are stable (Richardson & Pugh, 1981). In other words, the number of caseworkers hired is equal to the number of caseworkers leaving the agency. The equilibrium state typifies the relationship between turnover and clinical knowledge in the agency. Adding new caseworkers (agency growth) or increasing the rate at which workers leave the agency (agency decline) allows us to test hypotheses about the consequences of turnover for agency knowledge.

The model has three subparts: the caseworker tenure system, the caseworker census system, and the clinical knowledge system. All three subparts are interrelated through feedback loops. For example, the caseworker tenure and census systems are interrelated in a balancing feedback loop. The basic structure of this loop is shown in Figure 1. When a caseworker leaves the agency, the total number of caseworkers drops by one. This drop creates a job opening. The job opening is eventually filled as a new caseworker is hired, which brings the total number of caseworkers back to the original number—the equilibrium level. A similar feedback loop connects the caseworker tenure and clinical knowledge systems. The second loop is discussed below. Stocks in each part of the system were initialized with agency data. The model was calibrated in weeks because at this CMHC caseworkers typically give two-weeks notice before leaving the agency.

Caseworker Tenure System

Caseworkers at this agency evolve through five stages during their tenure with the agency. These five stages are represented with eight stocks and 13 parameters (see Table 1). This arrangement of stocks, flows, and connectors shows the work process of clinical caseworkers as a cascade of statuses from the time of hiring to the time of their leaving the organization. Each status is governed by a series of feedback loops. Employees can leave the system at each stage. The annual turnover rate is calculated as the number

![FIGURE 1 Dynamic balancing feedback loops between the caseworker tenure and census systems and clinical knowledge and learning.](image-url)
of caseworkers who leave each week multiplied by 52 (weeks) and divided by the total number of caseworkers.

In the first step, caseworkers begin a four-week period of orientation. The stock representing this first stage is labeled “New Caseworkers in Orientation.” Clinicians need approximately four weeks of orientation to gain the knowledge needed to bill for services. The state Department of Mental Health (DMH) requires orientation and continuing training for all clinical caseworkers beyond their degree programs in order to be credentialed by the agency to provide these services (State of Missouri, 2008). Additionally, the agency typically does not bill the DMH for the client contact hours of any new clinical caseworkers for the first four weeks.

After the four-week orientation period, clinical caseworkers advance to a training phase where they receive additional on-the-job training for 12 weeks. The stock for this second phase is labeled “Caseworkers in Training.” The feedback process governing the movement of caseworkers in and out of this stock is similar to the process described above for the orientation stock. During this training period, the clinical caseworkers are allowed to bill up to 20 client contact hours each week, which is about 74% of the hours normally billed by experienced clinical caseworkers.

Caseworkers who complete the training move into an early stage of experienced service delivery. The stock is referred to as “Early Experienced

| TABLE 1 Equilibrium Values for Stocks and Parameters of the Tenure Cascade Systems |
|---------------------------------|----------|
| Parameters                      | Weeks    |
| Average Weeks Early-Stage on Leave (sick, vacation, or maternity) | 2        |
| Average Weeks Late-Stage on Leave (sick, vacation, or maternity) | 2        |
| Weeks Early-Stage To Late-Stage | 100.7    |
| Weeks Late-Stage To Leaving     | 100.7    |
| Weeks New To Trainee            | 4        |
| Weeks Trainee To Early-Stage    | 12       |
| Average Weeks After Giving Notice To Leave (Experienced caseworkers) | 2        |
| Fractions                       |          |
| Early-Stage Experienced Quitting Fraction | 0.0005 |
| Late-Stage Experienced Quitting Fraction | 0.0005 |
| New Quitting Fraction           | 0.005    |
| Trainee Quitting Fraction       | 0.0025   |
| Stocks                          | # caseworkers at each stage |
| Orientation                     | 1.18887  |
| Trainee                         | 3.46271  |
| Experienced—Early-Stage         | 27.0309  |
| Experienced—Late-Stage          | 26.3692  |
| Workers On Leave (sick, vacation, or maternity) | 1.068 |
| Experienced Leaving (after licensure) | 0.523719 |
| Late-Stage Leaving (prior to licensure) | 0.0263692 |
| Early-Stage Leaving             | 0.0270309 |
Caseworkers." In this third phase, caseworkers are able to bill fully for client contact hours. Caseworkers spend anywhere between 20–27 client contact hours each week depending on program and location. Caseworkers remain at this level of experience for approximately two years.

In the fourth phase, employees with over two years on the job become late stage or highly “Experienced Caseworkers.” The DMH regulations and professional ethics also mandate that, prior to a caseworker resigning from the agency, a transition plan must be in place for each of the clients. These plans deal with transferring clients to a new worker, and are usually carried out over a two-week period. This is also the average amount of time before experienced clinical caseworkers leave the agency after giving notice.

Worker Census System

The worker census system is made up of the number of job openings for caseworkers. The stock is called “Caseworker Job Openings” and is governed by feedback processes illustrated above in Figure 1. The worker census system aggregates worker turnover as the average number of jobs vacant each week, which is 0.303161. The stock has three parameters of which agency turnover is a function: the total number of caseworkers needed (n = 60), the number of weeks to create a job (1-week), and the number of weeks to recruit a new caseworker (1-week). This process was represented as simply as possible to clearly link turnover with gains or losses of knowledge.

Clinical Knowledge System

The clinical knowledge system tracks the agency’s accumulation of clinical knowledge over time. In the model, the stock Clinical Knowledge is the aggregate clinical knowledge in the agency. It was initialized at a little over 300. Clinical knowledge is affected by caseworker turnover, material delays, and agency growth (see Table 2). Although empirical measures of clinical knowledge have not been developed, we assume that accumulation of clinical knowledge approximately follows a logistic S-shaped curve, rising steeply during the first two-years of clinical practice and then leveling off from that time on. The salient aspect of knowledge is not in the exactness of its measure, but in its proportional change over time. This conceptualization was borrowed from the diffusion of information theory (Bass, 1969; Bass, Krishnan, & Jain, 1994) further developed by Rogers (1995), and which has recently been applied to direct social work practice (Herie & Martin, 2002).

The model includes both the agency overall level of clinical knowledge and its average. The agency overall clinical knowledge is the total aggregate clinical knowledge in the agency, which is the amount of knowledge possessed by each caseworker times the number of current caseworkers. The agency average level of knowledge is simply the total level of knowledge divided by
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the number of caseworkers. This does not assume that all caseworkers are equally knowledgeable, but that there are several levels of knowledge possible. This is an index we have created to demonstrate the relative difference in the knowledge among caseworkers of different levels of experience.

The level of clinical knowledge for New Caseworkers in Orientation is assumed to be zero on an 11-point scale (0–10). These employees have little clinical knowledge and no experience to share with coworkers (low synergy; Nutley & Davies, 2001). This does not mean that those in orientation are empty headed, but that during their time in orientation, their level of knowledge does not add to the clinical knowledge of the agency. Furthermore, per Department of Mental Health policy, they are not yet knowledgeable enough to bill for work with clients during this period of time. Agency records confirm that less than 7% of new clinical staff has a state license at the time they are hired.

The average level of knowledge for Caseworkers in Training is rated as two on the 11-point scale because these workers are recent graduates with little practice experience and their time with clients is limited during the training period. Caseworkers receive this training for twelve weeks.

The knowledge level for Early Experienced Caseworkers is four because these workers have completed the training, learned basic skills and routines, and have accumulated 12 weeks of practice. Typically, workers remain at this early experienced level for two years. After two years of practice, the workers are considered late-stage experienced caseworkers. These late-stage experienced workers have accumulated considerable agency clinical knowledge. Therefore, the level of clinical knowledge for Experienced Caseworkers rises to an average of eight.

### TABLE 2 Equilibrium Values for Stocks and Parameters of the Clinical Knowledge Systems

<table>
<thead>
<tr>
<th>Clinical knowledge system</th>
<th>Parameters*</th>
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<tbody>
<tr>
<td></td>
<td>Average Knowledge Early Experienced</td>
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<tr>
<td></td>
<td>Average Knowledge Early leaving</td>
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<td>Average Knowledge Experienced leaving</td>
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<td></td>
<td>Average Knowledge Late Experienced</td>
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<td>Average Knowledge Late leaving</td>
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<td>Average Knowledge New</td>
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<td></td>
<td>Average Knowledge Trainees</td>
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<tr>
<td></td>
<td>Average Knowledge Leave (sick, vacation, or maternity)</td>
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<tr>
<td></td>
<td>Maximum Knowledge</td>
</tr>
<tr>
<td></td>
<td>Time (in number of weeks) to Absorb Knowledge</td>
</tr>
<tr>
<td></td>
<td>Effect of Gap on Learning:</td>
</tr>
<tr>
<td></td>
<td>Rate of Learning:</td>
</tr>
</tbody>
</table>

| Stocks | Clinical Knowledge | 328.257 |

* Downloaded by Washington University in St Louis at 09:48 14 March 2012
Individual levels of knowledge above eight are possible with extended practice, but these higher levels are achieved very slowly over years of practice. Employees on vacation or extended leave contribute zero knowledge to the agency during that period. When a caseworker gives notice that they are leaving the agency, their level of knowledge for their last two weeks is half of whatever level it was when they gave notice. The agency’s level of knowledge at any given point in time is the average of its caseworkers’ level of knowledge at that point of time.

Caseworkers typically remain with the agency for about four years. As noted above, they are considered highly experienced during the last two years of their tenure, and therefore possess considerable agency clinical knowledge. Losing these experienced caseworkers causes a drop in the agency’s level of clinical knowledge, but this loss is recovered as new caseworkers gain experience.

Leaving and Hiring

In this agency, it takes an average of about six weeks from the time a caseworker gives notice of quitting until their replacement starts. However, replacement time varies from as short as four weeks to as long as 12 weeks. For any given 12-week period, there are approximately four new clinical caseworkers in orientation, four in the training phase, four quitting, one on pregnancy leave, sick, or vacation. Everyone else is operating at full billing capacity. Even though caseworker positions are filled through the hiring process, there is a reduction in the level of clinical knowledge needed to perform the tasks. After caseworkers are hired, as noted above, the first month of employment is spent mostly in orientation.

When a caseworker gives notice of quitting, an announcement is made in the agency and an ad is posted in newspapers. It usually takes about two weeks for individuals to apply for the job. The number of applicants can range from zero to 100, depending on the availability of casework jobs in the area. When there are lots of casework jobs available in the urban areas of the region, it is difficult for the agency to attract applicants for the position, due to its more remote location.

Feedback Learning and the Clinical Knowledge Gap

A key feature of this model is the nonlinear feedback relationship between learning and clinical knowledge. The higher the level of knowledge in the organization, the more learning we expect to take place. Because we used an 11-point scale (0–11) to estimate levels of caseworker knowledge, the maximum knowledge capacity is equal to ten times the number of workers. In reality, a knowledge/capacity gap will always exist between the maximum knowledge capacity of the agency and the average clinical knowledge at any given point in time. This gap is represented by an equation that calculates the
difference between an agency's maximum capacity and the current level of clinical knowledge. The knowledge/capacity gap will be zero when clinical knowledge is zero, which is empirically impossible but theoretically meaningful as an anchor point. The knowledge/capacity gap will be 0.5 when knowledge is equal to one-half of the agency's maximum capacity. Also, the knowledge/capacity gap will be 1 when knowledge is equal to the agency's maximum capacity, which like the zero scenario is empirically unlikely but again a theoretically meaningful anchor. Therefore, when knowledge increases, the gap narrows, producing a positive effect on learning. The converse is also true, with a decrease in knowledge resulting in a widening of the knowledge gap and a negative influence on learning. As shown above in Figure 1, this part of caseworker learning is the result of a dynamic balancing feedback loop.

Model Validation
As recommended by Ford (1999, pp. 285–288), we assessed boundary adequacy, face validity, dimensional consistency, behavior reproduction, and model sensitivity. Validation involves “a continuous process of testing and building confidence in the model” (Sterman, 2000, p. 81). Boundary adequacy checked through the construction of causal loop diagrams, stock-flow diagrams, and direct inspection of model equations. Testing face validity involved talking through the structure of the model with agency personnel to ensure that it made sense (structural assessment), to confirm that the parameter values were appropriate (parameter assessment), and to establish that the flows were operating in the right directions. We tested dimensional consistency to ensure that the units of measurement for each variable in the equations are consistent. Baseline results were then examined to assure that the model reproduced an accurate count of clinical caseworkers and the agency's average annual rate of turnover. Finally, sensitivity analyses were conducted on all policy parameters. This involved finding out whether minor changes in a parameter generated major changes in turnover or knowledge, and whether small changes in assumptions create large changes in policy decisions. Sensitivity testing helped to establish reasonable limits for variables in the model.

HYPOTHESES AND RESULTS
Using the 2002–2005 employment data, which yielded a 208-week baseline, we conducted three experiments. Results from the model in equilibrium were compared to results with changes in various parameters. The purpose of these experiments was to examine how changes in selected parameters effected changes in clinical knowledge or average knowledge. Establishing the baseline model in equilibrium ensures that all stocks remain at a constant level. This makes it easier and more precise to determine how a specific
parameter change affects the results. Any change in the results can be attributed to the specific change made and only that change. This approach corresponds to scientific experiments that keep all variables constant except the ones studied. The model was developed and analyses were conducted using Vensim Personal Learning Edition (PLE) Plus for Windows, Version 5.5d (Ventana Systems Inc., 1988–2005). The model is available from the first author to anyone who wants to replicate or extend the theory. The Vensim PLE version is available free (http://www.ventanasystemsinc.com).

In the first experiment, we examined the effect of lengthening tenure for caseworkers on clinical knowledge. Specifically, we increased caseworker tenure by one and two years. For this experiment, agency clinical knowledge was used instead of average knowledge, because the number of caseworkers remained constant at 60. We hypothesized that longer tenure would have positive effects on clinical knowledge, raising the level of agency knowledge above the baseline.

In the other two experiments, we tested the effects of system changes on average knowledge, since the changes were in the number of caseworkers (agency knowledge would be artificially inflated with increased numbers of caseworkers). Recently, the agency added 11 new caseworkers. There was a question about whether it would be better to hire all 11 at the same time or hire one at a time over a one-year period (one every five weeks). The second experiment consisted of testing the effect of two different hiring policy changes on average knowledge. We compared the difference between hiring 11 additional caseworkers at one time with hiring 11 caseworkers over a one-year period. There was no basis in the literature for hypothesizing the best strategy for hiring these workers.

The final experiment assessed another real-world scenario that a manager could face. We modeled the impact of five experienced caseworkers leaving en masse (at 50 weeks) on average knowledge and replacing these with five new workers (at 70 weeks). It was assumed that if under normal circumstances it takes six weeks to hire a new worker (from the time the leaving worker gives notice), it would take several more weeks to hire five new caseworkers. This experiment compared the replacement of caseworkers with inexperienced ones versus with experienced caseworkers. Based on the logic of our theory, we hypothesized that hiring inexperienced workers would lower the level of agency knowledge, while hiring experienced workers would raise the level of agency knowledge.

Results

Experiment 1

The first test examined the consequences of longer tenure for caseworkers. Figure 2 shows that, when tenure is increased, agency clinical knowledge
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rises above the equilibrium level over the next two years. Furthermore, the increase of clinical knowledge is faster and levels off higher with a two-year increase in tenure than a one-year increase in tenure. If the tenure of these workers could be increased, the agency would benefit with an overall higher level of clinical knowledge.

EXPERIMENT 2

The second tests examined the consequences of agency growth. First, we consider hiring all 11 new workers at the beginning of the fifth year. Next, we spread the hiring out over the fifth year. Results show that in the short run, it is better to hire one at a time (see Figure 3). Hiring all 11 caseworkers at the same time causes a sharp drop in knowledge below the level of hiring one at a time, although in the long run both end up at the same level, approximately one-point below the baseline level. To investigate the long-term difference in the effects of these two policies, one would need to extrapolate beyond the time frame of our data.

EXPERIMENT 3

The third experiment compared average agency knowledge between the hiring of five inexperienced workers with hiring five early-experienced workers. Figure 4 shows an initial, expected drop in average knowledge at about week 50, at the loss of the five experienced caseworkers. The figure then shows that average knowledge briefly spikes and then drops.
when inexperienced workers are hired to replace experienced workers. Average knowledge, with this replacement option, stays below baseline throughout the 208-week period of the experiment. In contrast, average knowledge rises in comparison to both baseline and to the other replacement option when replacing the missing workers with experienced workers.
DISCUSSION

The theory and model reported in this paper demonstrate how system dynamics can help managers think through concepts such as clinical knowledge and employee turnover. The expression of causal relationships connects the theory directly to the ongoing work processes of CMHCs. The value of system dynamics modeling for CMHC managers manifests in the opportunity to clarify management decisions and policies and inexpensively test change initiatives.

This paper also draws together two streams of practical concern for managers of CMHCs: employee turnover and maintaining a learning environment. It seems *prima facie* that these organizations want to keep highly qualified, knowledgeable workers as part of their staff. Likewise, these organizations want to stimulate continual growth in knowledge over time. The experiments here have demonstrated an explicit connection between these two phenomena.

Our first experiment showed that it is reasonable to conceptually and empirically link knowledge with employee turnover; increasing tenure (changing the turnover rate) increases overall agency knowledge. In fact, turnover can be viewed as the loss of knowledge or diminished knowledge building in an organization. Increasing the length of tenure increased agency clinical knowledge. In an agency, the presence of highly qualified staff may mask the hiring deficit. A manager may not perceive the deficit over time through conventional means, such as monitoring monthly caseworker totals on a spreadsheet.

In Experiment 2, the model illustrated the impact of a hiring policy on knowledge. Growth in the overall number of caseworkers can cause the unintended consequence of lowering the average level of clinical knowledge in a CMHC. However, increasing agency size is likely detrimental to knowledge only in the short term. In relation to established clinicians, new hires usually have below-average knowledge and they need time to learn. Over an extended timeline, knowledge would more than likely return to equilibrium and then surpass it, as there would eventually be more late-stage (highly knowledgeable) workers. In the future, it may be helpful to explore other potential consequences to growth, such as increased pressures on staff with training responsibilities.

Experiment 3 tested the experienced versus inexperienced worker dilemma. Hiring experienced caseworkers increases average knowledge. In addition to the pressures to simply maintain consistent numbers of caseworkers, CMHC managers have to contend with the possibility of replacing workers in the event of a sudden loss of several workers. What is important is not just the numbers of individuals hired, but the knowledge level of those individuals. It is tempting in the short run to hire less experienced workers because they are also less expensive, but this practice may be costly for a considerable length of time with respect to clinical knowledge.
The ramifications of these experiments point to further exploration of the importance of clinical knowledge building in service organizations. For instance, the level of agency knowledge is not simply a matter of how experienced each individual clinical staff member is, but also how synergistic is the environment (see Kurtzberg & Amabile, 2001). We have assumed that learning is affected by not just the length of tenure for caseworkers, but also by feedback from the agency’s level of knowledge. The greater the proportion of experienced caseworkers, the more knowledge-rich the environment is. It is widely accepted that in agencies like CMHC, which rely heavily upon learning by doing, knowledge deprecates over time and such depreciation is amplified by high turnover (Darr, Argote, & Epple, 1995). Our theory specifies stages of experience that contribute to the level of agency knowledge as well as how changing levels of agency knowledge feedback to affect caseworker learning. Other than the feedback effect on caseworker learning, our theory does not account for agency costs and consequences stemming from changes in the level of knowledge. Including financial variables will further increase the usefulness of the theory to CMHC managers.

Our theory and model has the potential to benefit CMHC managers even more by expanding to include topics regarding caseworker tenure, such as job stress (Zautra, Reynolds, & Eblen, 1987), burnout (Geurts, Schaufeli, & De Jonge, 1998), job satisfaction, and money attitudes (Tang, Kim, & Tang, 2000). For instance, hiring delays may cause burnout by making it seem like there are enough caseworkers, when there really are not. This may lead to increased pressures on current staff to maintain caseloads and to staff burnout. A salient point in our theory and research is the practical value of focusing on the social structure of services (Henggeler et al., 2002) and on communication processes as a whole (Rogers, 1976). One hurdle in this endeavor is that CMHC managers must see the “market value” of learning and innovation within their organizations (Herie & Martin, 2002).

Questions For Future Research

There are, of course, many questions regarding knowledge and turnover left unanswered in this study. Here we comment on several questions considered to be of special importance to CMHC managers. To begin with, we have assumed that there is an S-shaped curvilinear relationship between clinical knowledge and years of experience. This assumption is based in part upon organizational theory (Rogers, 1995; Rogers & Scott, 1997). However, it is not known if knowledge builds in the same manner in clinical social service organizations as it does in industry settings. Therefore, there is a need for research to test this relationship in counseling settings.

The hypotheses tested in this study give no indication about the range of acceptable turnover rates with respect to organizational knowledge. Zero turnover results in stagnation. One hundred percent turnover dampens the
level of agency knowledge. The optimal rate of turnover is probably low and probably varies under changing environmental conditions. Empirical evidence on the range of acceptable rates would help CMCH managers create sustainable agency growth policies.

In conclusion, our embryonic theory of caseworker tenure as specified in a system dynamics model provides a foundation for understanding how the structure of CMHCs governs the relationship between caseworker turnover and agency knowledge. This is not the same as stating that the relationship between employee turnover and clinical knowledge is moderated by organizational structure. It is not same because the structure of CMHCs incorporates multiple interrelated feedback loops. The operation of these feedback loops determines the outcomes observed. CMHC managers who understand how to orchestrate these feedback loops are likely to improve agency outcomes over time. System dynamics offers tremendous potential in helping CMHC managers express and clarify theory, communicate complicated feedback ideas, and execute preliminary tests of alternative policy without having to commit caseworker time.

REFERENCES


