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From Data to Wisdom: Quality Improvement Strategies Supporting Large-scale Implementation of Evidence-Based Services

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The goal of this article is to illustrate various strategies that the Hawaii Child and Adolescent Mental Health Division (CAMHD) adopted to increase the use of empirical evidence to improve the quality of services and outcomes for youth. We operate from the premise that evidence-based decision making extends beyond the use of treatment outcome literature to inform decisions regarding treatment selection. We elaborate a list of common clinical decisions, discuss multiple evidence bases that may inform these decisions, and use a model of the phases of evidence to illustrate multiple quality improvement strategies used within the Hawaii system of care for youth. This article provides a broad overview to various quality initiatives for promoting evidence-based practices rather than in-depth discussion of any specific strategy.

Background

Major systems reform has pervaded the Hawaii system of care for youth for more than a decade. Two federal lawsuits played important roles in promoting

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these developments. First, in 1991, the State of Hawaii settled a class action lawsuit with the US Department of Justice for violations of the civil rights of individuals residing at Hawaii State Hospital. Second, in 1994, because of a failure to provide necessary mental health and educational services as required by the Individuals with Disabilities in Education Act and Section 504 of the Rehabilitation Act, the federal courts enjoined the State of Hawaii Departments of Health and Education in the Felix Consent Decree. The state was charged with establishing a system of care to provide effective mental health and special education services for children and youth in need of such services to benefit from their education.

Following a large-scale community planning effort, the early system response to these directives focused on building service capacity, promoting multi-agency coordination, and establishing quality monitoring. Implementation of these reforms yielded large increases in the number of youth accessing services, the amount and type of services available, and the total expenditures for mental health services. The statewide quality monitoring structure relied heavily on system and child reviews performed by interagency monitoring teams [1] and developing information systems to manage child registrations, service authorizations, electronic billing, and claims adjudication. The output of this quality system was extensive qualitative and rudimentary quantitative feedback to stakeholders during review debriefing sessions and management reports illustrating the increasing population, services, and expenses.

With these successes in place, the reform focus evolved to questioning if the expanded investment contributed to improved outcomes. Large-scale dissemination of evidence-based services was explored as an initiative to improve child outcomes [2]. Stakeholders also wanted assurances of resource efficiency and services that effectively improved lives. Empirical evidence again was sought as the arbiter of claims. To support continued system development, the focus of the Hawaii CAMHD shifted to identifying (1) clinical decisions that could be more evidence based, (2) evidence bases that could support these decisions, and (3) approaches for linking the evidence bases to the decision making. CAMHD efforts have targeted administrative and clinical processes, but this article focuses on evidence-based clinical decision making. This discussion may be readily generalized to the business context.

Core clinical decisions

Many decisions are made on a daily basis in the clinical context. A fundamental strategic concern for system management is clarifying priorities regarding which common decisions should be targeted for systemic development. Some common clinical decisions include (1) where to treat clients, (2) how to treat clients, (3) who should treat clients, (4) whether quality services are being provided to clients, (5) whether clients are getting better, (6) how to manage and supervise treatment, (7) who should make the decisions. These decisions by no

means constitute a comprehensive list but represent many of the perennial questions faced by CAMHD.

When designing a comprehensive treatment system that serves diverse consumer populations across many settings and through numerous service agencies and service providers, one is faced with the strategic decision of whether to build evidence bases to educate individual decisions or to package these decisions in some meaningful fashion. The empirically supported treatment movement has headed strongly in the direction of packaging decisions into structured treatment programs, so that the single choice about which treatment program to select guides the answer to the other core questions. For example, the evidence-based multisystemic therapy program is designed to serve youth in the home and community setting using family therapy and behavioral techniques, measure quality using therapist and supervisor adherence measures, monitor instrumental and ultimate outcomes, and provide these services through treatment teams, team supervisors, and a higher level cross-team supervisor [3]. The fundamental choice to use the multisystemic therapy program essentially answers the other questions about where to treat, how to treat, who should treat, how to determine quality and outcomes, and how to manage the services.

As a brief aside, the decision-making circumstance at the individual clinician level generally differs from the systemic and programmatic decision-making situations. For example, a systemic treatment selection decision may be "Given the characteristics of the client population seeking services, the outcomes the system is trying to achieve, the available funding, the available workforce (eg, agencies and providers), and the capacity for workforce/provider development, what treatment programs should be made available to clinicians and consumers?" The resulting system design may function to constrain the options from which an individual clinician can choose. For example, if a system is designed so that clinicians operate within settings (eg, outpatient versus residential) but across populations and programs, a clinician's key treatment selection question may be "Given my context (eg, outpatient setting), my client's characteristics (eg, 17-year-old girl), and the target for my consumer's treatment (eg, depressed and withdrawn behavior), what treatment program should be selected (eg, medication, interpersonal psychotherapy for adolescents [4], or adolescent coping with depression [5])?" It is beyond the scope of this article to address the multitude of forms the treatment selection decision may take, but the complexities associated with the diversity of decision contexts across analytic levels are important to keep in mind.

Returning to our main theme that the treatment selection decision fundamentally guides other core clinical decisions when a treatment system is designed at the program level, building an evidence base to educate the treatment selection decision may be viewed as a proxy for building many evidence bases needed to educate these other core decisions. Once the treatment program is selected, systemic quality management often focuses on whether the appropriate clientele are accessing the service, whether treatment programs are implemented with integrity to their design (ie, whether the subsequent core decisions are being

answered as programmatically specified), and whether sufficient resources (eg, workforce, skills, funding) exist to support the system. Program-based design may become problematic at the system level if each program uses different quality measures, different outcome measures, and different management structures. At the individual provider/consumer level, program-based design may become problematic when youth characteristics are a poor match with program focus and when youth have completed all the best programs but remain in need of service. Based on this type of analysis, CAMHD staff reasoned that the treatment selection decision was a good place to start building evidence-based clinical decision making but that the system also needed to move beyond the selection decision to inform the additional decisions systematically.

In CAMHD's analysis, three common models for treatment selection were identified, namely the evidence-based services model, the individualized case conceptualization model, and the practice-based evidence model. These models rely on four common evidence bases to inform the treatment selection decision. The evidence-based services model relies on evidence from the general services and intervention research literatures to identify treatments with scientific support for their efficacy and effectiveness. The individualized case conceptualization model relies on case-specific historical evidence and evidence of the general causal mechanisms underlying the problem at hand. The practice-based evidence model relies on case-specific historical evidence that is locally aggregated to identify relevant treatments that have worked best with similar cases in the local system. Although these models are oversimplified in this article, they highlight the four key evidence bases that may inform treatment selection.

CAMHD views each of these evidence bases as providing important information, but each also has notable limitations. Currently, any single model is insufficient for system management because of gaps in the available evidence and biases in clinical decision making [6]. These different models require integration into a full system model (Fig. 1) to best inform the multitude of decisions by the different stakeholders that are a routine part of clinical service delivery. Fig. 1 conceptually illustrates that four key databases are used to assist treatment teams (or individual providers, depending on system design) in making the core clinical decisions. To date, CAMHD's efforts have focused heavily on building strategies for three evidence bases (ie, case-specific history, local aggregate summaries, and general services and intervention research databases). We believe, however, that realizing the long-term potential for mental health services lies in the development and delivery of knowledge from the fourth evidence base about the causal mechanisms underlying psychopathology and recovery.

A common issue across the three treatment selection models (ie, evidence-based services, individualized case conceptualization, and practice-based evidence models) is that of the appropriate basis for matching interventions to individual youth. In one of its most salient forms, this often presents as the question of whether diagnosis should serve as the basis for treatment selection. Addressing the nuances of this issue is beyond the scope of this article, and differing perspectives continue to be represented within the CAMHD system [7].

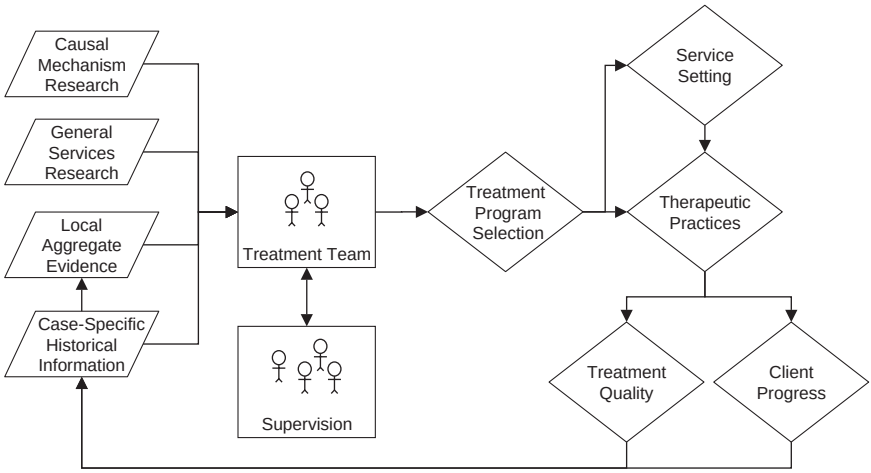


Fig. 1. System model that illustrates the four core evidence bases and their relation to key service decisions.

The CAMHD analysis has tended to focus on treatment targets, not just diagnosis, as a core driver of treatment selection. Relevant treatment targets are identified during service planning, are negotiated with consumers and professionals, and are related to, but distinct from, diagnoses. This is not a traditional model in which diagnosis is the focus of treatment and the service goal is elimination of the disorder that causes impairment. Instead, diagnosis is viewed as a key proxy variable that summarizes common targets for change, highlights plausible etiologic pathways, and serves as an important contextual factor for matching interventions to targets.

For example, a preadolescent boy with a diagnosis of attention deficit hyperactivity disorder and his family may seek home-based services to improve academic achievement and increase positive family functioning. In this case, the set of relevant treatments include those found to improve academic and family functioning in contexts that approximate the characteristics of the current case (ie, preadolescent boy diagnosed with attention deficit hyperactivity disorder, home-based setting). On the other hand, treatments that reduce symptoms of attention deficit hyperactivity disorder (eg, attention, hyperactivity) but do not alter academic or family functioning might not be considered despite the fact that the treatment matches the case on primary diagnosis.

At the system design level, this example highlights the importance of understanding the common targets of interest to relevant stakeholders when selecting interventions. For example, because of its relationship with the department of education, academic achievement might be a much more common target of intervention for the CAMHD population than is typical in other service

systems. Accordingly, designing the system to include programs that improve academic functioning is a high priority.

Managing evidence bases

When designing and managing evidence bases to support clinical decision making, CAMHD staff have found two general frameworks to be useful. First, CAMHD attempts to apply basic scientific values and evaluate proposed developments against the criteria of whether they will be structured, reliable, valid, useful, publicly verifiable, distributable, and self-correcting over the long run [8].

A second useful framework describes the phases of evidence as data, information, knowledge, and wisdom [9]. Data refer to discretely identifiable units; information is data represented in a context that provides meaning; knowledge is information that is helpful for decision making; and wisdom is awareness of when to apply knowledge. When applied to developing evidence bases, this model highlights the activities of defining and capturing relevant data, organizing and analyzing it into meaningful units for consumers, delivering the information to the decision-making situation, and prioritizing use of the knowledge bases. In analogy, the quality improvement system acts as a video camera (focusing on each of the evidence bases) and as a video monitor (delivering the relevant information at the locus of decision making).

The remainder of this article focuses on illustrating the strategies that CAMHD uses to manage evidence-based clinical decision making. The phases of evidence framework is applied to the four relevant evidence bases identified previously. Finally, CAMHD's evidence-based clinical decision-making process is presented and illustrated.

Services research strategies

Hawaii's system of care for youth maintains an interagency evidence-based services committee that is responsible for reviewing the services research literature and providing guidance to decision makers [2,10]. This committee has identified at least two sources of relevant data: research articles and treatment protocols. The data from these sources are organized into information through the use of efficacy, effectiveness, and practice element codes. (For more details, the reader is referred elsewhere [2,7].) The methodology and results of research studies are used to assign treatments to a level system that describes the reliability of each treatment's efficacy. Various contextual features of the intervention (eg, setting, format, cost) are coded to aid in matching treatments to the decision makers' particular circumstance. Finally, the specific practices used within each protocol are coded to provide additional detail as to the protocol's procedural content and to promote practice profiling across studies.

Various strategies have been developed to deliver this information to the many decision-making contexts. One of the most widely adopted strategies has become affectionately known as the "blue menu." This one-page matrix summarizes evidence-based services with target problems in the rows, the efficacy level in the columns, and the description of the treatment packages in the cells (Table 1). Psychosocial treatments are represented on one side and psychopharmacologic interventions are on the other. Whereas the blue menu provides a roadmap to the efficacy level of various services, the biennial report of the evidence-based services committee provides detailed information on the full coding of the interventions and includes convenient reference tables, including information relevant to treatment contexts [10].

In addition to these direct summaries, service research information is incorporated into interagency performance standards and practice guidelines that serve as a contractual attachment when the system procures services for youth. These standards and guidelines are incorporated into ongoing performance and contract monitoring activities. CAMHD also maintains a practice development office that is responsible for providing interagency training, mentoring, and consultation to promote ongoing skill development and dissemination of service research information. Funding structures are also viewed as a mechanism for delivering service information to clinical decision makers. Although CAMHD has a flexible funding benefit that allows for construction of customized services when appropriate, many treatment teams initially elect to use the services included in the standing CAMHD service array. Developing long-term contracts with structured reimbursement protocols for evidence-based programs (eg, multisystemic therapy [3]) and including these programs in the routine service array increases the likelihood that they will be selected and be readily available as front-line treatments. Along with the performance monitoring activities mentioned previously, CAMHD has evolved its utilization management procedures to monitor whether relevant populations are receiving evidence-based levels of care and whether service usage is consistent with practice guidelines.

Case history strategies

CAMHD has targeted local case-specific data from regular clinical interactions in the form of clinical assessments, service authorizations, and billing records. A multitude of structures organize these data into information. Diagnoses from the "Diagnostic and Statistical Manual" [11] are used to summarize the complexities of clients' symptomatology and service plans organize treatment targets and interventions data. Quarterly standardized assessments are used to monitor symptomatology (Achenbach System of Empirically Based Assessment [12]), functioning (Child and Adolescent Functional Assessment Scale [13]), and service needs (Child and Adolescent Level of Care Utilization System [14]). Treatment providers complete a monthly summary that measures treatment settings, formats, targets, progress ratings, and practices using context and prac-

Table 1
Example of one-page summary of evidence-based child and adolescent psychosocial interventions. Hawaii's "Blue Menu"

Problem area	Level 1: Best support	Level 2: Good support	Level 3: Moderate support	Level 4: Minimal support	Level 5: Known risks
Anxious or avoidant behaviors	CBT: Exposure, modeling	CBT with parents, group cognitive behavior therapy, CBT for child and parent, educational support	None	Eye movement desensitization and reprocessing, play therapy, individual (supportive) therapy, group (supportive) therapy	None
Attention and hyperactivity behaviors	Behavior therapy	None	None	Biofeedback; play therapy, individual or group (supportive) therapy, social skills training, "Parents are Teacher," parent effectiveness training, self-control training	None
Autistic spectrum disorders	None	None	Applied behavior analysis, functional communication training, caregiver psychoeducation program	Auditory integration training, play therapy, individual or group (supportive) therapy	None
Bipolar disorder	None	Interpersonal and social rhythm therapy[a]	Family psychoeducational interventions[a]	All other psychosocial therapies	None
Depressive or withdrawn behaviors	CBT	CBT with parents, interpersonal therapy (manualized IPT-A), relaxation	None	Behavioral problem solving, family therapy, self-control training, self-modeling, and individual (supportive) therapy	None

Disruptive and oppositional behaviors	Parent and teacher training, PCIT	Anger coping therapy, assertiveness training, problem-solving skills training, rational emotive therapy, AC-SIT, PATHS, and FAST track programs	Social relations training, project achieve	Client-centered therapy, communication skills, goal setting, human relations therapy, relationship therapy, relaxation, stress inoculation, supportive attention	Group therapy
Eating disorders	CBT[a] (bulimia only)	Family therapy (anorexia only)	None	Individual (supportive) therapy	Some group therapy
Juvenile sex offenders	None	None	Multisystemic therapy[c]	Individual or group (supportive) therapy	Group therapy[c]
Delinquency and willful misconduct behavior	None	Multisystemic therapy	Multidimensional treatment foster care, wrap-around foster care	Individual therapy, juvenile justice system	Group therapy
Schizophrenia	None	None	Behavioral family management[a], family-based intervention[a], personal therapy[a], social interventions[a]	Supportive family management[a], applied family management[a]	None
Substance use	CBT[b]	Behavior therapy, purdue brief family therapy	None	Individual or group (supportive) therapy, interactional therapy, family drug education, conjoint family therapy, strategic structural systems engagement	Group therapy

This tool has been developed to guide teams (inclusive of youth, family, educators, and mental health practitioners) in developing appropriate plans using psychosocial interventions. Teams should use this information to prioritize promising options. For specific details about these interventions and their applications (eg, age setting, gender) see the most recent evidence-based services committee biennial report (http://www.hawaii.gov/health/mental-health/camhd/resources/index.html).

[a] Based on findings with adults only.

[b] Appropriate only if child is already in inpatient setting, otherwise consider level 2.

[c] If delinquency and willful misconduct are present.

tice element codes consistent with those used for the services research reviews by the evidence-based services committee.

A primary strategy for delivering this information to decision makers was the development of on-demand, user-friendly, graphics-based clinical reports in the management information system. Through an analogy with the instrument panel for driving a car, these reports have become known as the "clinical dashboards" for driving cases. To reduce demands on consumers and facilitate consistent communication, two figures were selected to represent all relevant data [15]. Adapted from single subject design representations [16], a line graph represents historical quantitative information, and a scatterplot represents historical qualitative information. Fig. 2 illustrates a global individual case summary that includes diagnosis, basic outcomes, interagency involvement, and the levels of care received. Users can "drill-down" into increasing depth of information, including scale scores, progress ratings, and even history of specific therapeutic practices. In addition to the on-line clinical reports, various operational reports also present case-specific information, such as sentinel event/critical incident reports, service gap and mismatch reports (eg, youth who have not received planned services within 30 days), and grievance reports.

As a cornerstone of its service monitoring activities, CAMHD uses case-based reviews [1] and administrative reviews. The annual review process uses small random samples from each region and each provider. A trained monitoring team reviews records, conducts interviews, and scores a structured case review protocol appropriate to the targeted service. Case-based reviews consume information from the standardized case reports described previously and generate unique information through use of a structured, multi-method review protocol and team-based review of the obtained data. In addition to written monitoring reports, debriefing sessions are conducted to deliver the knowledge to stakeholders, and action plans are developed when appropriate.

Incorporation of the standardized reports is encouraged (and in some instances required) at regular case presentations and practice reviews at the regional guidance centers, at clinical supervision, at individual service team meetings, and at various statewide professional development activities for the clinical leadership. Statewide practice development personnel and clinical leaders at the regional guidance centers also provide case-specific consultation and mentoring to front-line supervisors and service providers.

Local aggregate evidence strategies (practice-based evidence)

Local aggregate evidence is based on the same data sources as the case-specific evidence but is aggregated across cases into meaningful composite units. It is important to note, however, that administrative system transactions and operations also provide an important data source for aggregate evidence. For example, a timely credentialing transaction with a specific service provider may determine the availability of that provider for clinical intervention with a youth and may have implications for making decisions related to the youth's clinical

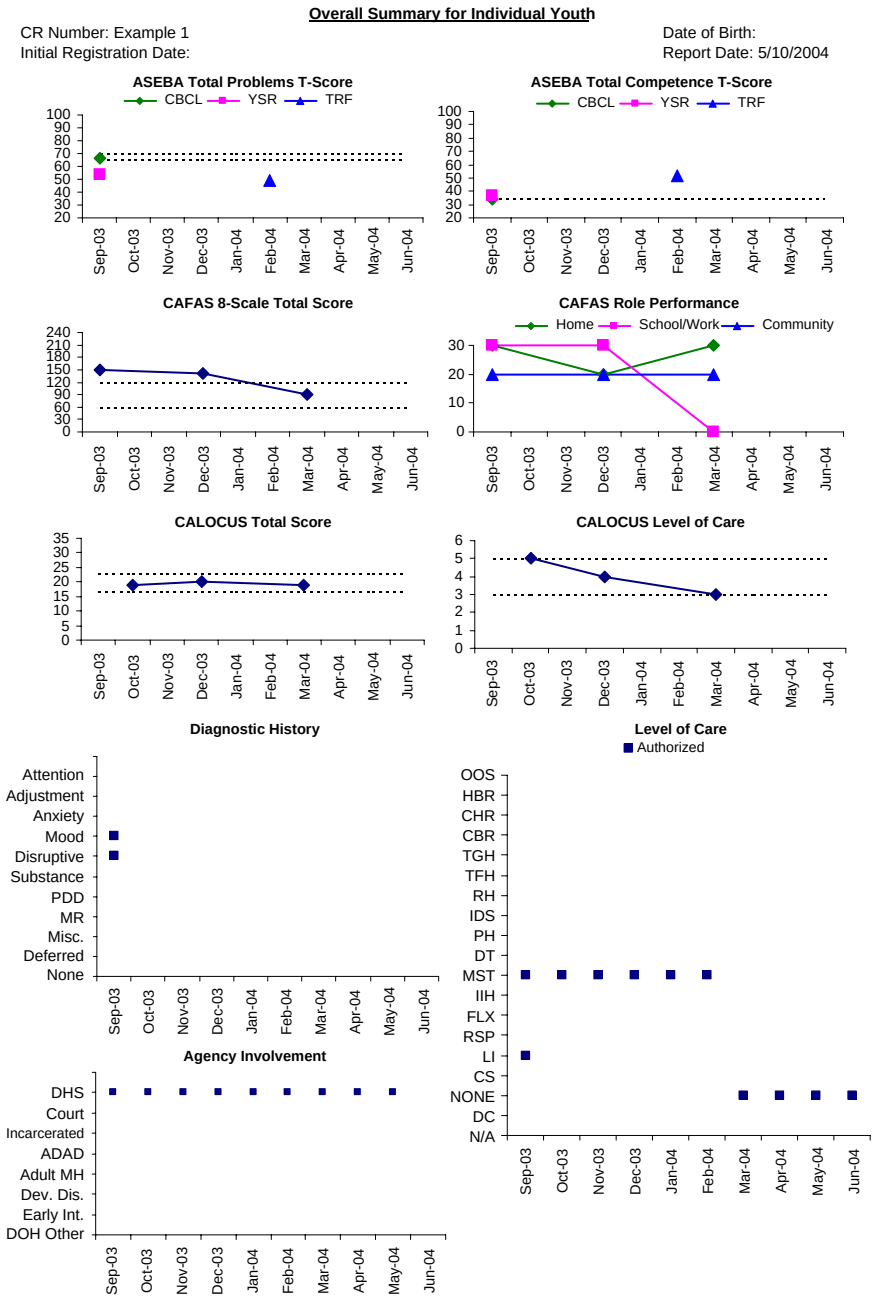
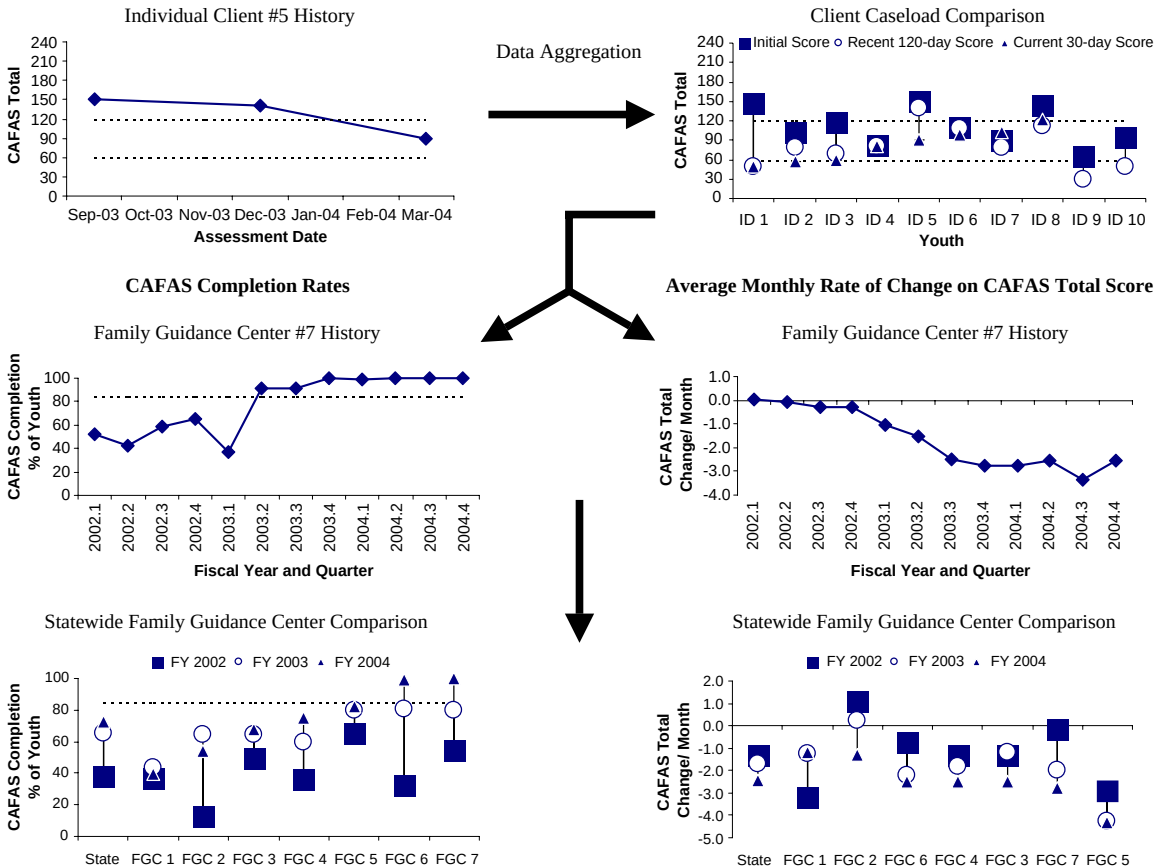


Fig. 2. Example of an overall case history report from the clinical report module of the Child and Adolescent Mental Health Management Information System.


Individual Client #5 History
CAFAS Total
240
210
180
150
120
90
60
30
0
Sep-03 Oct-03 Nov-03 Dec-03 Jan-04 Feb-04 Mar-04
Assessment Date
Data Aggregation
Client Caseload Comparison
Initial Score
Recent 120-day Score
Current 30-day Score
CAFAS Total
ID 1 ID 2 ID 3 ID 4 ID 5 ID 6 ID 7 ID 8 ID 9 ID 10
Youth
CAFAS Completion Rates
Average Monthly Rate of Change on CAFAS Total Score
Family Guidance Center #7 History
CAFAS Completion % of Youth
100
80
60
40
20
0
2002.1 2002.2 2002.3 2002.4 2003.1 2003.2 2003.3 2003.4 2004.1 2004.2 2004.3 2004.4
Fiscal Year and Quarter
Family Guidance Center #7 History
CAFAS Total Change/ Month
1.0
0.0
-1.0
-2.0
-3.0
-4.0
2002.1 2002.2 2002.3 2002.4 2003.1 2003.2 2003.3 2003.4 2004.1 2004.2 2004.3 2004.4
Fiscal Year and Quarter
Statewide Family Guidance Center Comparison
FY 2002
FY 2003
FY 2004
CAFAS Completion % of Youth
100
80
60
40
20
0
State FGC 1 FGC 2 FGC 3 FGC 4 FGC 5 FGC 6 FGC 7
Statewide Family Guidance Center Comparison
FY 2002
FY 2003
FY 2004
CAFAS Total Change/ Month
2.0
1.0
0.0
-1.0
-2.0
-3.0
-4.0
-5.0
State FGC 1 FGC 2 FGC 6 FGC 4 FGC 3 FGC 7 FGC 5

care. CAMHD tracks an extensive array of data on the quantity, timeliness, and quality of a diversity of administrative transactions, including the number of credentialing applications, the latency to credentialing process completion, and the number of errors in transactions between the credentialing office and the information system office.

Many of the strategies for organizing case history data into information also are used at the aggregate level (eg, diagnosis, standardized outcome measures). Aggregate data also are organized into information through the specification of performance measures [17]. A performance measure is a quantitative indicator of system functioning. Performance measures may be defined to assess the functioning of any component of a business process (eg, individual, group, business transaction, or clinical outcome). Most commonly, performance measures are indicators of the quantity, quality, timeliness, or consumer satisfaction with the targeted process. For example, data on number of applications and number of interoffice transaction errors may be organized into a monthly performance measure on the percent of credentialing transactions accepted on first submission by the information system office. This performance measure might be useful for educating personnel allocation, task training, and transaction format redesign decisions. Highly customized analysis and special studies of population, service, fiscal, performance, and outcome data are also used to organize aggregate data into information.

To deliver aggregated information, a standardized unit comparison dashboard was adopted. Fig. 3 illustrates the process of data aggregation through an alternation of the unit history and unit comparison dashboards. This illustration demonstrates how information on child functioning (lower scores indicate better functioning) is transformed and aggregated from an individual client history through a caseload report to two system performance measures on percent of youth with assessments completed during the quarter and the monthly average rate of change in functioning during the current treatment episode for youth served during the quarter. The unit comparison dashboard was designed to facilitate identification of common patterns across units and detection of atypical units for further review, whereas the unit history dashboard supports more in-depth review and detailed understanding. In the clinical reporting system, standardized clinical caseload reports are available on demand for quick analysis of cross-case patterns. Although not illustrated in this article, a standardized one-page presentation template that incorporates these dashboards is used for performance measure presentations. Performance measures are presented in verbal, visual, and written format on a regularly scheduled basis to designated managers and quality improvement committees.

Fig. 3. Example of how data are aggregated and displayed for the Child and Adolescent Functional Assessment Scale (CAFAS) from clinical client history and caseload reports to administrative performance measures for a regional family guidance center and for statewide comparison of performance trends across family guidance centers.

Several critiques of local aggregate evidence systems are common. First, data often are old and dated by the time they are collected, analyzed, and delivered in a usable format. Second, clinical and business problems may require short-term solutions that prohibit building and validating a new component of a large-scale information system. Third, if the speed of information delivery is accelerated, then the quality of information declines (ie, there is a speed-accuracy trade-off). Although CAMHD has made considerable progress in developing a timely and responsive statewide information system, much information remains to be integrated into the central information system. Special purpose information tools are produced in the form of stand-alone databases and spreadsheets designed to structure local data capture and provide immediate analysis and feedback using the standard dashboard presentation formats. Although regionally distributed, these tools are regularly collected and aggregated into statewide summaries. Although they do not support the integrity of the centralized information system, they provide a cost-effective, rapid development environment for information system innovations.

To deliver information from special studies, customized evaluation reports are written, summary slide shows are prepared, and results are presented to stakeholder groups, including designated quality improvement committees. When appropriate, findings are posted on the Internet for public reference. The quality improvement committees are responsible for making recommendations for action to executive management, who assign staff and resources to implement strategically selected actions. To facilitate interpersonal diffusion of information and develop diverse change agents [18], quality improvement committee members are recruited from broad stakeholder groups, including service consumers, providers, and personnel who represent assorted system functions. Regional branch chiefs also periodically extend broad invitations to stakeholders to attend public performance presentations. Finally, as with the services research, local aggregate evidence may inform best practice guidelines.

Causal mechanism strategies

The rapid expansion of the scientific literature and understanding of causes in the development of psychopathology offers considerable promise for improving the mental health of children. The past decades have witnessed increased coverage and availability of research studies through searchable computer database (eg, Educational Resources Information Center, Medline, PsychInfo) and increased access to expert knowledge through various telehealth programs. The President's New Freedom Commission on Mental Health [19] emphasized the importance of accelerating the progression from discovery to implementation of services in communities.

Currently, CAMHD relies heavily on its professional personnel to identify, consume, and apply knowledge of causal mechanisms. In addition to research articles, the training and experiences of the working professionals provide the

core causal mechanism data. These data are organized into information through facts, theories, and opinions. The primary pathway for delivery of this information is the memory and judgment of treatment team members. This often is the most comprehensive evidence base that provides a rich breadth of knowledge where other evidence bases are lacking. For example, professional knowledge of causal mechanisms is often sought to construct interventions for treatment-resistant youth who have received the "best" empirically supported treatments but have not yet met treatment goals.

Despite this breadth of application, relying on individual professionals to gather and organize evidence related to causal mechanisms yields an evidence base that is unstandardized and variable in nature. As an evidence base, individual human memory and judgment fail to satisfy basic scientific values (eg, publicly verifiable), and information-processing biases may be the norm [6]. An opportunity seems to exist for improving the management of causal mechanism knowledge through improved information and communication systems that use structured protocols for monitoring, aggregating, and delivering causal evidence and facilitate its coordination within treatment teams (including youth and families). Managing the causal mechanism evidence base remains a relatively unexplored frontier for the CAMHD system.

Integrating the evidence: Hawaii's foray into wisdom

Fostering these evidence bases creates a data, information, and knowledge-rich environment. The next logical step is to build supports that allow decision makers to apply the "best" knowledge available to solve their current problem. This is wisdom, and it remains a precious resource. With the goal of wisdom clear in its sights, the CAMHD system has begun an initial venture into evidence-based clinical decision-making guidance. Among the many decision-making contexts, CAMHD has targeted clinical supervision as a primary application domain for integrating this broad array of evidence. Fig. 5 depicts a decision flow that is used to address several of the core clinical decisions.

When a new child enters the system, the first decision faced is that of treatment selection. The evidence-based decision-making flow prioritizes the services research evidence base and recommends use of the evidence-based service reports (ie, blue menu, biennial report) and practice guidelines to select an evidence-based service. For new cases, this choice most likely involves performing an assessment to generate case-specific evidence, followed by service planning that includes matching the newly acquired case evidence to a relevant evidence-based treatment. As services are implemented, ongoing supervision and case management address the question of whether significant concerns have emerged for the case. The decision guidance prioritizes review of case history evidence for critical incidents, such as sentinel events or grievances, and local aggregate evidence to determine the typical frequency of such incidents in the local environment. For example, if a few seclusion events are reported for the

youth and local aggregate data indicate an elevated seclusion rate at a particular provider agency associated with temporarily increased staff vacancies, fundamental modification to treatment practices may be unnecessary in the short term. Alternatively, critical incidents without a contextual moderator may call for reconsideration of treatment selection or application of a specialists' causal mechanism knowledge.

Supervision next proceeds to the question of whether a youth is making clinical progress. The flow chart prioritizes the case history in the clinical reports to educate this decision. If a youth is making progress, continuation of the current treatment is recommended (regardless of whether it is a qualifying evidence-based service according to the general services research). If a youth is not improving, the appropriateness of the treatment selected is reconsidered. Case history (ie, clinical reports) and services research evidence (ie, evidence-based services reports) are prioritized for guiding this decision. If a treatment selection problem is identified, then the guidance recommends identifying relevant barriers using services research, local aggregate, and causal mechanism evidence and revising the treatment plan to select a more favorable intervention (Fig. 4).

If a youth is not improving despite the proper selection of an appropriate, evidence-based treatment, then the next decision concerns the quality or integrity of the treatment provided. This decision prioritizes the general services, local

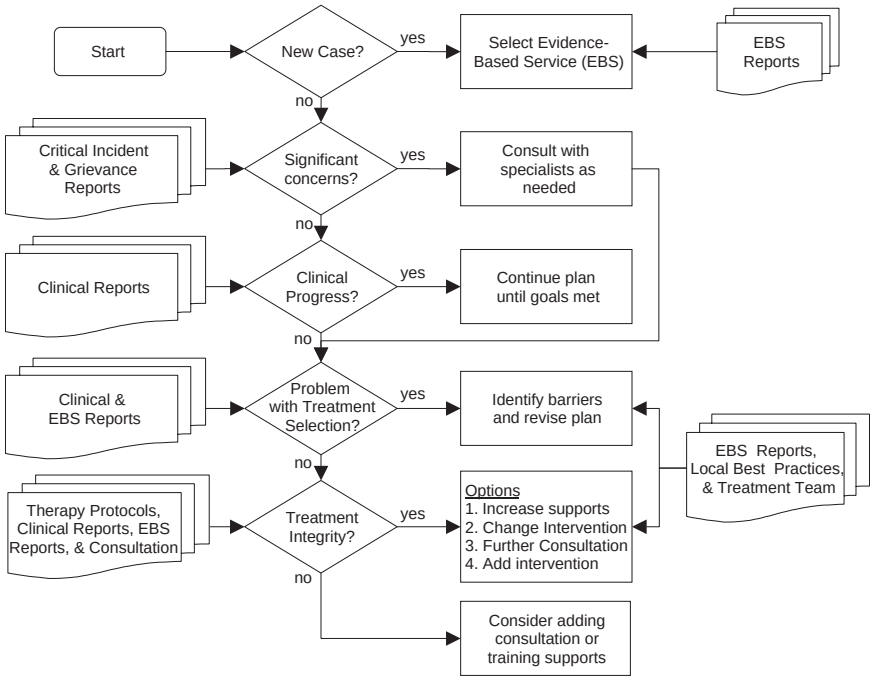


Fig. 4. Decision flow chart that models the Hawaii Child and Adolescent Mental Health Division's guidance for evidence-based clinical decision making.

aggregate, and case history evidence to review the specific practices that are part of the empirically based protocols, the practices that were part of other effective implementations in the local environment, and the practices that were used with the specific case in question. If problems with treatment quality or integrity are identified, then additional consultation or training is recommended to improve treatment quality and increase integrity. If no treatment integrity problems are identified, then a difficult situation is encountered: the best evidence-based treatments have been selected and implemented with high quality but have not helped the client sufficiently. At this point, evidence requirements may need to be relaxed and the ''next best'' evidence from all sources be applied to find interventions (eg, increase supports, change or add interventions, add additional experts) that hopefully will interact favorably with the client's circumstance to produce change.

Final illustration

One risk of such guided decision making is the potential for drift into micromanagement. A decision maker can turn quickly from feeling supported to feeling burdened by guidance. A related risk in the attempt to educate many decisions is that a system may become overburdened with data gathering. The cost of data gathering, analysis, and delivery must be weighed constantly against the realized benefit of improved decision making. CAMHD staff continually struggle with the temptation to gather relatively easy and inexpensive data without a clear and essential tie to decision making. This may paradoxically increase decision-making errors by creating ''red herrings'' and ''cognitive noise.''

The CAMHD system and its provider network have been working to strike a balance between providing sufficient guidance and oversight without micromanagement. Currently, providers maintain responsibility for the detailed, day-to-day service integrity and case monitoring (eg, daily phone surveys used with multidimensional treatment foster care [20], fear ratings used with cognitive-behavioral therapy for pediatric anxiety [21], and therapist adherence measures used with multisystemic therapy [3]), whereas the system maintains responsibility for providing less frequent, independent, standardized assessments of case progress, coordinating data, analyses, and decision guidance across providers, and managing intelligence related to general research and federal activities. The provider-to-system-level gap is spanned through the use of monthly treatment and progress summaries supplied by providers.

We conclude by providing an illustration of the synergy of this organization with respect to the treatment of depression using the CAMHD practice element codes [22]. Fig. 5 presents a comparison of the practice profiles obtained from (1) coding the general psychosocial services literature, (2) aggregated information from monthly provider summaries for youth with a


Practice Element
EBS Level I Study Groups (%, n = 6)
Actual Care
Individual Case
Cognitive/Coping 100
Activity Scheduling 86
Psychoeducational-Child 86
Problem Solving 71
Self-Monitoring 71
Social Skills Training 57
Skill Building/Behavioral Rehearsal 57
Self-Reward/Self-Praise 57
Communication Skills 43
Therapist Praise/Rewards 43
Modeling 43
Psychoeducational-Parent 43
Maintenance/Relapse Prevention 43
Relaxation 43
Peer Modeling/Pairing 29
Guided Imagery 29
Relationship/Rapport Building 14
Family Engagement 14
Tangible Rewards 14
Assertiveness Training 14
Stimulus Control/Antecedent Man. 14
Supportive Listening/Client-Center 0
Family Therapy 0
Natural and Logical Consequences 0
Emotional Processing 0
Insight Building 0
Commands/Limit Setting 0
Parent Coping 0
Parent Praise 0
Educational Support/Tutoring 0
Crisis Management 0
Medication/Pharmacotherapy 0
Parent-Monitoring 0
Line of Sight Supervision 0
Mentoring 0
Time Out 0
Milieu Therapy 0
Twelve-step Programming 0
Mindfulness 0
Response Prevention 0
Interpretation 0
Motivational Interviewing 0
Functional Analysis 0
Response Cost 0
Ignoring or DRO 0
Exposure 0
Play Therapy 0
Catharsis 0
Directed Play 0
Marital Therapy 0
Free Association 0
Biofeedback/Neurofeedback 0
Other (Write-in) 0
Thought Field Therapy 0
Eye Movement/Body Tapping 0
Hypnosis 0
0.0 0.2 0.4 0.6 0.8 1.0
Proportion of Youth (n = 230)
M J J A S
Calendar Month

primary diagnosis of depression or dysthymia (actual care panel), and (3) historical information from the monthly provider summary for a specific case (case history). This type of analysis is insufficient to represent the moment-to-moment interactions between clinicians and clients, but from a quality review perspective, it may generate some interesting hypotheses about potential areas for performance improvement. For example, at first glance, the actual care panel indicates that not every youth in the system is currently treated with an evidence-based protocol. Many of the core practices incorporated in evidence-based protocols are implemented to some degree in the local care system, yet three of the five most commonly represented practices in the set of level I evidence-based protocols (ie, activity scheduling, child psychoeducation, and self-monitoring) were only used with roughly one half of cases in actual care. The open bars further indicate that many additional practices that were not included in the evidence-based protocols are used in the local care system. This may identify opportunities for improved efficiency through more focused interventions.

Examination of the individual case history follows a similar pattern. This youth's treatment began with several practices evident in the evidence-based protocols (ie, cognitive/coping, problem solving, communication skills) and included an additional practice element focusing on a parent's self-care (ie, parent coping). In the third month of treatment, intervention strategies became much more diffuse and included many additional practice elements that were and were not evidence based for depressed and withdrawn behavior. Other clinical reports required examination to understand the context associated with this proliferation, but this pattern and the inclusion of the milieu therapy and line of sight supervision elements is common in youth admitted to residential treatment (eg, related to suicidality). Taken together, it is clear that the observed treatment does not adhere closely to a single evidence-based protocol. Comparison of this individual case history to the aggregate actual care panel suggests that the treatment of the youth was fairly typical relative to similar youth in the local system. If the youth does not experience improvement with the current regimen and depressed or withdrawn behavior remains a target of treatment, the analysis identifies several evidence-based practices (ie, activity scheduling, child and parent psychoeducation, self-monitoring, self-reward, peer modeling, relaxation, guided imagery, assertiveness training, tangible rewards, stimulus control, and maintenance/relapse prevention) that might be considered as potential "next steps."

Fig. 5. Practice element profiles that illustrate the percent of study groups ($n = 6$) coded in the Hawaii evidence-based services literature review as qualifying in the category "Level 1 Best Support" for depressed or withdrawn behavior, the proportion of youth with a primary diagnosis of unipolar depression or dysthymia ($n = 230$) that actually received each practice element for one or more months during the fiscal year, and an individual case history that indicated whether each practice element was provided during each of five calendar months in the youth's treatment episode. Solid symbols identify practice elements that were included in at least one qualifying research study, and open symbols indicate practice elements that were not included in the qualifying studies.

Summary

This article described several of the strategies to promote and monitor the adoption of evidence-based decision making in Hawaii's system of care for youth. We identified several key clinical decisions that help focus our development efforts (ie, where and how a youth should be treated, whether the youth is receiving quality services, whether the youth is getting better, who should treat the youth, and how the youth's care should be supervised/managed). We specified the four evidence bases that may help educate these key decisions (ie, case history, local aggregate, general services research, and causal mechanism research). We introduced a few problems we encounter when we approach design from a treatment program versus treatment system perspective. We illustrated our efforts to deliver knowledge from the evidence bases to the key decision situations and described our struggle with the wisdom to guide prioritization among the evidence bases to keep from overwhelming decision makers.

This article discussed the Hawaii system of care's intensive engagement in the process of quality improvement but did not address whether these system reforms have yielded positive results for youth. The interested reader is referred to the performance reviews regularly published on the Child and Adolescent Mental Health Division Website [17,23]. In one notable analysis of the past 3 years, CAMHD [24] found evidence for a two- to threefold increase in the average monthly rate of improvement for youth as indexed by parent, teacher, and clinician reported measures of symptomatology and functioning. With many of the initial system reform goals achieved, new challenges have emerged. In the continual search for a better system, the CAMHD system may discard some of its current strategies, but one hopes that our future progress will continue to be guided by the best available evidence.

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