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Health-Related Workplace Productivity Measurement: General and Migraine-Specific Recommendations from the ACOEM Expert Panel

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An establishment of health-related productivity measurements and critical evaluation of health-related productivity tools is needed. An expert panel was created. A literature search was conducted to identify health-related productivity measurement tools. Each instrument was reviewed for: 1) supporting scientific evidence (eg, reliability and validity); 2) applicability to various types of occupations, diseases, and level of severity of disease; 3) ability to translate data into a monetary unit; and 4) practicality. A modified Delphi technique was used to build consensus. The expert panel recommended absenteeism, presenteeism, and employee turnover/replacement costs as key elements of workplace health-related productivity measurement. The panel also recommended that productivity instruments should: 1) have supporting scientific evidence, 2) be applicable to the particular work setting, 3) be supportive of effective business decision-making, and 4) be practical. Six productivity measurement tools were reviewed. The panel recommended necessary elements of workplace health-related productivity measurement, key characteristics for evaluating instruments, and tools for measuring work loss. Continued research, validation, and on-going evaluation of health-related productivity instruments are needed. (J Occup Environ Med. *2003;45:349–359*)

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Large employers have been a major purchaser of health care benefits within the United States since the 1940s.[1] Employers are increasingly concerned about the burden of illness in their workforce and its impact on their bottom line. The total cost of ill health to business and industry is comprised of not only the direct medical costs but also the even greater health-related productivity* costs due to absenteeism and presenteeism. In fact, these health-related productivity costs are typically two to three times the medical costs.[2] Employers are recognizing that their employees are their most valuable corporate assets and that employee health is the key driver of enterprise performance.

Health and productivity are inextricably linked. Therefore, with increasing medical costs, health-related productivity losses, and limited available resources, now more than ever before employer groups need to be able to determine the value or return on investment of the health care interventions that they purchase and their employees receive. Potential benefits from employer-purchased health care interventions such as disease management, disability management, optimal pharmaceutical utilization,

*Throughout this paper, when "productivity" or "health-related productivity" is mentioned, it is referring to that dimension of productivity impacted by health or health-related productive capacity.

and health promotion programs include reduced medical costs and decreased productivity losses associated with the firm's workforce. Various diseases and disorders can lead to significant lost productivity.

For instance, the estimated economic impact of migraine headache is substantial, ranging from $1.4 to $17.2 billion dollars per year.[2–5] The economic burden may be attributable to the high prevalence and disability associated with migraine. Migraine headache affects 18% of women and 6% of men[6] and occurs primarily in people 25–44 years of age,[6,7] the age when most individuals are in the workforce. The chronicity of migraine headaches, along with the severity of symptoms and disability, often places migraineurs at risk for experiencing significant lost productivity and disability.[3,8–12]

Fortunately, effective medications for migraine, which have demonstrated reductions in patients' lost workplace productivity, are available.[9,13–17] Studies have determined the lost productivity associated with migraine headaches as well as the changes in productivity loss after patients receive migraine-specific therapy.[8,12,14,15,18–22]

From an employer perspective, there is ambiguity concerning the most appropriate factors for measuring work loss for patients with migraine headache. In addition, for a given type of workforce, there is uncertainty as to which lost productivity measurement tool(s) may be most appropriate. Therefore, a critical evaluation of the existing lost workplace productivity measurement tools is needed to examine the characteristics of each instrument to determine the advantages and disadvantages of each tool in the measurement of lost workplace productivity of patients with migraine headache within the context of specific employment settings.

The objectives of this project were to: 1) develop consensus recommendations on the productivity metrics necessary for assessing and analyzing work loss for the migraineurs as well as for the general population; 2) identify and critique the currently available workplace productivity instruments; and 3) establish future research initiatives within the field of workplace productivity measurement.

Methods

Expert Panel Created

An expert panel on productivity measurement was created. To establish the panel, the relevant productivity literature was reviewed and a list of names was developed. Additional names were obtained by asking candidates to refer other individuals who were appropriate given their level of expertise within the field of productivity measurement.

Literature Review

A literature search was conducted using MEDLINE, HealthSTAR, PsycINFO, and EconLit databases, covering the time period between 1966 and 2000, to identify and review the currently available productivity measurement instruments and tools. The search strategy included these terms individually and combinations of these terms: lost productivity, productivity, work loss, days missed from work, absenteeism, presenteeism, conceptual model, theoretical model, and indirect costs. A review of the bibliographies of the retrieved manuscripts was performed to identify other relevant literature.

The members of the expert panel identified additional publications related to assessing work loss, productivity, or other relevant measurement instruments. Subcommittees of the expert panel were developed; each was charged with one aspect by which to review all of the identified instruments. The aspects were: 1) supporting scientific evidence (ie, reliability and validity); 2) applicability to occupations and diseases; 3) ability to support effective business decision-making (ie, ability of the data to be translated into a monetary unit); and 4) practicality, (ie, ease and cost of administration). In addition, the developers of the identified lost workplace productivity instruments were contacted by subcommittee members to gain additional information (ie, reliability, validity testing) as needed.

The review excluded quality of life instruments, which have been used as an approximation for productivity impairment. The quality of life instruments that were examined do not attempt to measure lost workplace productivity and were excluded from this analysis.

Consensus Building

The selected expert panelists were invited to attend a 1-day meeting to review and critique productivity concepts and the identified workplace productivity instruments. Using a modified Delphi technique, consensus was reached for the: 1) necessary elements for productivity measurement; 2) key characteristics that workplace productivity instruments should possess; 3) recommended instrument(s) that capture workplace productivity loss for migraineurs as well as for the general population; and 4) possible workplace contextual issues (ie, corporate culture, regulatory issues, and management buy-in) that greatly affect an organization's ability to measure employee productivity. This technique involved administering a premeeting survey to refine definitions of productivity, consensus-building at the expert panel meeting, conducting multiple postmeeting reviews, and refining of the concepts before final acceptance of the recommendations by the expert panel members.

Results

Eighteen people participated on the expert panel. The panel was a multidisciplinary group comprised of recognized leaders in the area of health and productivity management as well as representatives from business coalitions and employers. Seven of the participants represent em-

TABLE 1
Elements of Health-Related Productivity Measurement

- Absenteeism
  - Workers' compensation
  - Short-term disability
  - Long-term disability
  - Sick leave
  - Family medical leave
  - Personal time off
  - Unpaid leave
- Presenteeism
  - Time not on task
  - Quality of work
    - Incidence and magnitude of mistakes
    - Capacity for peak performance
    - Injury rates
    - Caregiver issues
  - Quantity of work
    - Work capacity or output
  - Personal factors
    - Social
    - Mental
    - Physical
    - Emotional
    - Functional status
- Employee turnover and replacement costs

ployer groups, seven are health care consultants, one represents employer coalitions, two are academicians, and one is a government researcher.

Elements of Health-Related Productivity Measurement

The expert panel identified numerous components of productivity and identified the key elements of lost productivity measurement to be absenteeism, presenteeism and employee turnover or replacement costs. (Table 1) Absenteeism is generally defined as the number of days missed from the workplace.[23] Reasons for absenteeism include workers' compensation, short-term disability, long-term disability, sick leave, family medical leave, personal time off, and unpaid leave.

Presenteeism is the health-related productivity loss while at paid work.[23] Presenteeism may include: 1) time not on task (eg, in the workplace, but not working); 2) decreased quality of work (eg, increased injury rates, product waste, product defects); 3) decreased quantity of work; 4) unsatisfactory employee interpersonal factors (eg, personality disorders); and 5) unsatisfactory work culture. Employee turnover and replacement costs include the decreased productivity output associated with the cost of hiring and training new employees.[24]

TABLE 2
Key Characteristics of Health-Related Productivity Instruments

- Science based
  - Reliable
  - Valid
- Applicability
  - Across industries and occupations
  - Across disease states and conditions
  - Specific to migraines
- Supports effective business decision-making
  - Metrics can be translated into dollars
- Practical
  - Easy administration
  - Low costs of administration
  - Reading level
  - Available in multiple languages

Key Characteristics of Health-Related Productivity Measurement Instruments

The expert panel discussed and identified the core characteristics that an instrument should possess to adequately assess the workplace productivity loss of migraineurs and of workers suffering from other diseases. The key characteristics were grouped into four categories: 1) supporting scientific evidence, 2) applicability to a variety of occupations and disease states, 3) ability to support business decision-making (ie, ability for data to be translated into a monetary unit), and 4) practicality (Table 2).

The first key characteristic—the scientific evidence supporting each instrument—includes the evidence for reliability and validity of the measures, along with the scales or factors that are targeted by these measures.[25] Reliability is primarily a question of the consistency of a measurement tool. For the purposes of this review, we have focused on questions of validity of the instrument:

1. independent of all other factors, ie, the performance of individual items, and factors or scales in the instrument, irrespective of any characteristics of the sample, and
2. in context of health impairment, work, and other relevant experiences of participants, ie, how the instrument works in context:
   a. Does the instrument distinguish between conceptually different issues? and
   b. Does it agree with different kinds of measures of the same concept?

Researchers submitted data analyses for the expert panel members to review. Because the data properly belong to each of the principals, it is not possible to publish those analyses here. Key results are described, but the data that support these descriptions must be obtained from the authors of the instruments.

The second key characteristic, applicability, was defined as the ability of the instrument to be used across a broad spectrum of industries, occupations, and disease states. In order to support business decision-making, the third characteristic, the value of lost productivity, needs to be estimated and appraised. Therefore, the data generated from each instrument were examined for their ability to be translated into a monetary unit. The last criterion, practicality, relates to the tool's ease of administration (ie, self-administered versus interview-administered), availability in multiple languages, and administration costs.

Review of the Instruments

The expert panel reviewed currently available workplace productivity measurement tools and identified nine as potentially applicable to migraineurs. However, based on an initial review, only six instruments were found to best represent the characteristics of applicability, business decision-making, and practicality, as outlined above. This does not mean the instruments excluded do

TABLE 3
Summary of the Recommended Health-Related Workplace Productivity Measurement Instruments[a]

	Practical				Scientific Evidence		Metrics Captured		Applicability			Supports Effective Business Decision Making
General	Ease adm	Cost adm	Read level <8th Grd	Multi-lang	Reliability	Validity	Absent	Present	Across indust/occ	Across other disease	Specific to mi-graines	Translates into mon-etary units
EHCA*	x	x	x	1	Moderate	Different diseases	x	x	x	x	x	x
HPQ	x	x	x	29	Moderate	Under development	x	x	x	x	x	x
SPS-6	x	x	x	1	Under development	Under development		x	x	x		
WLQ	x	x	x	3	very high	Different diseases and productivity	x	x	x	x	x (MWPLQ)	x
WPAI	x	x	Unknown	13	n/a	Different diseases	x	x		x		x

[a] The assessments contained in the above chart are based on personal interviews with the developers of the instruments, analysis of data provided for review, as well as, information contained in Measuring Employee Productivity: A guide to self-assessment, by Lynch and Reidel, 2001 Edition. (41)

* To date, peer-reviewed published data are unavailable.

EHC, Employer Health Coalition of Tampa Assessment Instrument; HPQ, Health and Performance Questionnaire; SPS-6, Stanford Presenteeism Scale; WLQ, Work Limitation Questionnaire; WPAI, Work Productivity and Activity Impairment Questionnaire.

not have merit. Rather, it relates to the fact that the expert panel eliminated from consideration those instruments that did not meet minimum standards on three of four core characteristics. In addition, instruments were eliminated if they were not applicable for the measurement of workplace productivity loss of migraineurs. Each of the six productivity tools was then analyzed against these core characteristics and summarized in Table 3. Each of the tools is discussed briefly below.

Employer Health Coalition (EHC) of Tampa Assessment Instrument.

The EHC of Tampa Assessment Instrument is a relatively new self-report tool, consisting of two parts. The first portion of the questionnaire captures general information on employee productivity as well as patient demographics, salary information, healthy behaviors, health status metrics, comorbidities, household health information, health plan utilization, health plan satisfaction, provider satisfaction, and process-of-care metrics (personal communication; Frank Brocato). The second portion of the assessment consists of a disease-specific questionnaire inquiring about the impact of a specific disease on the individual's productivity. In addition, outcomes of care, the utilization of medication, and alternative therapies are captured (personal communication; Frank Brocato).

The EHC's "Healthy People/Productive Community Survey" is a proprietary and restricted instrument. Material discussed here has been provided by EHC and is included with their permission. The primary focus of the review of the EHC instrument was the four-item "impairment at work" scale. In addition to the data analyses supplied by EHC, the executive summary of the self-published report, "The Hidden Competitive Edge—Employee Health and Productivity,"[26] has provided information for this review.

EHC Four-Item Impairment at Work Scale. Data analyses were provided for the general instrument (n = 6003) and for the migraine instrument (n = 264). Most of the EHC instrument concerns health care delivery issues. However, there are four items related to the degree of limitation while working. In addition, there are related items that serve to support the measurements taken by the four items of central interest to the present review. The first EHC work limitation item is a dichotomous impairment screening item. The second and third items concern interpersonal communications and work quality and are measured on a short Likert scale. The fourth item measures overall productivity on a long Likert scale.

The EHC staff submitted correlations with a number of Short Form (SF)-36 and SF-12 items and summary scales related to physical and mental functioning. Further, the EHC publication[26] lists a variety of disease and symptom comparisons. Also, the EHC staff report testing a large number of disease-specific work limitation instruments, with more on the way.

Evaluation of the EHC Four-Item Impairment at Work Scale. With a sample size of 6000 workers, it is not surprising that only a small amount of impairment was detected by the general instrument. However, combined with the results from the migraine instrument, the data demonstrate that the EHC instrument is useful for a variety of medical conditions and sensitive to measuring the impairment caused by those conditions.

The correlations reported with the SF-36 and SF-12 items and summary scales are modest to very good indicators of convergent validity for health problems. However, there is no independent assessment of workload or of productivity separate from health problems in the EHC instrument.

Overall Evaluation of the EHC Four-Item Impairment at Work Scale. The review and discussion of this instrument and the four items for which analyses were provided is limited by the proprietary nature of the material. The most exciting and most positive information identified during the course of this review is the extensive effort by EHC to test their instrument on as many distinct disease states as possible. Assuming that the correlations for other diseases and symptoms are similar to the pattern of correlations included with the migraine and general instruments, EHC is well on its way to creating a very adaptable and sensitive tool. Furthermore, as a very short instrument, it is an excellent candidate for repeated (daily or weekly) administrations over the course of several months. Such administrations could be accomplished in 5 minutes or less and could help to establish an identifiable pattern of lost productivity (presenteeism) events.

EHC reports that it is reevaluating the impairment at work scale and considering a number of options to improve the instrument. Based on the subcommittee's review, the EHC has been shown to be easy to administer and applicable across many disease states as well as across many industries and occupations (Table 3). In addition, it attempts to measure absenteeism and presenteeism, which can be appraised in order to create an estimate of workplace productivity loss (personal communication; Frank Brocato).

Health and Performance Questionnaire (HPQ)

The HPQ is also a relatively new instrument that has been developed by researchers at the Harvard Medical School Department of Health Care Policy in collaboration with the World Health Organization (WHO) with support from the John D. and Catherine T. MacArthur Foundation. The HPQ is a brief self-report instrument designed to assess the impact of health on four aspects of work functioning: time missed from work, performance while at work, injuries or illnesses at work, and job turnover. A more detailed description of HPQ can be found at http://www.hcp.med.harvard.edu/hpq.[27]

It may be used in an employer setting as well as in clinical trials (personal communication; Prof. Ron Kessler). Studies were recently completed to evaluate the reliability and validity of the HPQ but were not completed at the time this review was carried out.[28] Professor Ron Kessler at Harvard Medical School provided analyses of the nine productivity items in the HPQ along with two additional assessments of overall work performance. The first nine items in the instrument measure productivity on a short Likert scale There are two items which solicit each worker's overall assessment of his/her performance in the past 30 days on a long Likert scale.

Analyses were provided for the HPQ nine productivity items (n = 1935, World Health Organization: National Comorbidity Sample Replication, NCS-R), and for the two 0–10, overall work performance ratings (n = 281), taken at two time points, three months apart. Except for one item, the nine HPQ productivity item responses indicated no productivity loss. The most likely explanation is that the majority of the respondents did not perceive themselves to be impaired. The responses on the overall performance ratings were close to a normal, albeit somewhat truncated distribution. In fact, the majority of the participants responded exactly the same or with a $\pm$ 1 deviation at time 2 compared to time 1. The moderately strong correlations between time 1 and time 2 suggest that these measures may be very useful indicators of overall work performance.

Overall Evaluation of the HPQ Items

At the time this review was undertaken, the validation analyses on

these and other items were still underway. As noted above, these analyses were subsequently completed but are not included in the current evaluation.[28] Our review suggests that the overall performance items are likely good (or perhaps very good) indicators. Further, with careful modification, the nine performance measures might become quite useful tools for a daily or weekly assessment.

A measure of work performance impairment relates to workload, health problems, and actual performance. Future development of this instrument should consider adding both self-report and other measures of workload, along with separate assessments of health status. The number of hours of work is a very useful measure, but it does not really assess workload or performance. These observations apply well beyond the HPQ. For a detailed consideration of a variety of related issues, see Amick et al.[29]

In terms of practicality, the HPQ has been translated into 29 languages for use by the WHO to assess work role functioning in 25 countries (personal communication; Prof. Ron Kessler). Based on a review of confidential information provided to the designated subcommittee, the HPQ appears to be applicable across many industries and occupations. In addition, the MHPQ captures absenteeism and presenteeism, which can be appraised in order to estimate the value of productivity loss.

Stanford Presenteeism Scale (SPS-6)

The SPS-6 was designed to assess how an individual's health condition affects his behavioral, emotional, and cognitive functioning at work.[30] The SPS-6 consists of six questions, and each question consists of a five-item Likert response scale ranging from "strongly disagree with the statement" to "strongly agree with the statement." This instrument is designed to measure presenteeism and is currently being further refined and field-tested by several employers to determine its value in setting program priorities and evaluating program effectiveness (personal communication; Dr. Kenneth Pelletier). Additional studies are currently underway and not yet published. Therefore, the subcommittee of the expert panel was provided with data (personal communication; Dr. Kenneth Pelletier) to review in order to determine how the instrument measured the basic elements of productivity and met the characteristics of the health-related workplace productivity measurement instruments identified by the panel.

The SPS-6 is new and, as such, more extensive validation studies are underway. Therefore, at this point, it is premature to determine how effectively the SPS-6 instrument measures presenteeism. This is certainly an instrument to watch as more data are produced. The SPS-6 does appear to meet the practical application criteria and is available in both electronic and hard copy formats (personal communication; Dr. Kenneth Pelletier).

Migraine Work and Productivity Loss Questionnaire (MWPLQ)

In 1999, Lerner et al[31] developed the MWPLQ. This tool was designed to measure the impact of migraine headache on a patient's work performance.[31,32] The 26-item questionnaire measures difficulties performing on-the-job work demands due to migraine. Separate data for the MWPLQ were not submitted. Dr Debra Lerner was involved in the development of both the MWPLQ and the work limitations questionaire (WLQ). For the scientific review of its related instrument, please refer to the discussion of the WLQ below.

The MWPLQ has face validity and appears to have high internal consistency within each work domain (Cronbach's alpha ranges from 0.86–0.95), has moderate to strong construct validity, and exhibits discriminant validity.[32] The MWPLQ captures employee absenteeism and presenteeism by asking five questions on the hours of paid work lost due to migraine and percent effectiveness while working with migraine.[22] These five questions may be used to calculate the total number of hours of work lost due to migraine and to appraise the time lost from work. No evidence was found that the MWPLQ is available in multiple languages.

Work Limitations Questionnaire (WLQ)

Lerner et al developed the WLQ to measure the impact of chronic diseases and treatment for on-the-job work performance.[33] The WLQ consists of four demand scales: time, physical, mental-interpersonal, and output. Dr Debra Lerner has been the principal contact for conducting the review of the WLQ. Dr Lerner and her staff were very generous in supplying well-documented and comprehensive information about their instrument to the subcommittee of the expert panel. In addition to the analyses discussed below, this review has benefited from material published in Lerner et al,[33,34] and Amick et al,[29] as well as several draft manuscripts by Lerner et al.[35,36]

Data from six separate studies using the WLQ—with a total of nearly 1300 participants—were supplied for this review. The analyses from the two largest samples and a small study that is still underway were selected for examination. These samples were: 1) osteoarthritis patients ($n = 224$);[34] 2) call center and warehouse personnel ($n = 654$);[33] and 3) National Institute of Mental Health (NIMH) depression study sample ($n = 82$). The results from the remaining three studies were examined and judged not to be substantially different from the results presented below. The three studies described here were judged as sufficiently representative to suffice for the present review. Lerner et al[34] provides cross-

validation with selected chronic diseases: rheumatoid arthritis, chronic daily headache, and epilepsy, as well as with measures from the SF-36. Lerner et al[36] provides cross-validation with worker productivity in the call center study.

The 25 items in the osteoarthritis and call center studies are consistently and uniformly positively skewed. The precise degree of skew varies, but all of the items show a similar distribution. The three nonphysical scales in the NIMH study clearly show less skew; thus the NIMH sample appeared to be more impaired than the osteoarthritis and call center samples.

The item correlations within each scale (time, physical, mental-interpersonal, and output) are very strong. In addition to patterns of convergence within the scales, we also look for patterns of divergence between scales or groups of items. The physical items are highly intercorrelated, but they are also quite distinct from the remaining items in all three studies. The degree of divergence that is observed between the physical and all the other scales is not observed between the three nonphysical factors: mental-interpersonal, time demands, and output demands. While the correlations within factors are quite high, the correlations between items in different (nonphysical) factors are also quite high. Consequently, if there is an effect to be measured, these items will likely agree on the measurement. Finally, internal consistency reliability in the WLQ scales is quite high.

The conclusions that can be drawn from the correlations, factor analyses, and alpha reliabilities are:

1. the mental, interpersonal and output factors are highly interrelated;
2. the Lerner et al[33] assignment of interpersonal items to the mental factor is supported in the NIMH depression study factor analyses but not in the factor analyses of the other two studies;
3. based on the current results, researchers using the WLQ in the future should analyze their data carefully to determine how these three sets of items are behaving in their own study.

The cross-validations to disease or disability and to productivity are important. For example, there is clear discrimination in the different WLQ subscales with respect to sensitivity to the particular chronic problem(s) assessed.[33] In addition, the association to objectively measured productivity for call center and warehouse workers[33] is a critically important step for this entire literature. Lerner et al[33] is an important step in connecting personal assessments of limitations to workplace productivity.

There is no direct assessment of workload distinct from the productivity and the health problems reported by the respondents. Measures of productivity are akin to a combined result from the demands of the workplace and the activity level, including impairment of the individual. Finding an association between chronic health problems and reduced productivity is an excellent start. However, to be certain that the reduced productivity is a reflection of poor health, it is important to develop an independent assessment of workload demands as well.

Development of the WLQ Index. Once an instrument or set of scales has been tested, validated, and found useful, it is appropriate to consider standards, norms, or some other combined measure. The WLQ index, currently under development, is one such measure. The goal of the index is to combine the findings from the four WLQ constructs into a single indicator of productivity loss.

The Technical report[35] describes the calculation of the WLQ index. The calculations described in the technical report are based on the call center and warehouse personnel study. Very briefly, a scale score for each WLQ scale was created for each subject. Subjects with more than 50% missing were dropped. Missing scores for the remaining subjects were estimated based on the mean of the subject. Then a factor analysis was performed on the scale scores. The results of the factor analysis were then used in a regression procedure to estimate the productivity of the call center employees. The regression yielded coefficients for the index.

The idea of the index, combining the measures on all four scales and comparing the result to productivity measures, is an important and meaningful goal. Future assessments in new work settings should calculate the index score as well, using the data observed in the new settings. Such a calculation may allow for a comparison between very different occupations and industries. If the comparisons show similar patterns of results, the WLQ index may prove to be a very important measure of productivity loss.

The WLQ is self-administered and does assess the productivity impact across multiple medical conditions as well as across industries and occupations. A national survey is in the field collecting normative WLQ data for occupation, industry, condition, and sociodemographic groups. Norms are expected to be available by the end of 2003. Additionally, once completed, the WLQ index will improve the ability of researchers to translate lost workplace productivity observations into a monetary unit.

Work Productivity and Activity Impairment Questionnaire (WPAI)

Margaret Reilly at Reilly Associates was contacted regarding the WPAI. Ms Reilly recommended three publications for further examination.[37–39]

In 1993, the WPAI was developed for assessing productivity losses by measuring the effect of general health and symptom severity on work productivity.[37] There are several versions of the questionnaire available including the WPAI-

general health (GH), WPAI-specific health problem (SHP), combination WPAI (GH-SHP) and WPAI-allergy specific(AS).[40] The WPAI-GH instrument consists of six questions that ask the patient the number of hours missed from work activities (ie, absenteeism) as well as the degree of impairment (ie, presenteeism) over the past seven days. The scores of the questionnaire are expressed as impairment percentages with higher numbers reflecting greater impairment and decreased productivity.[40] The four scores are 1) percent work time missed due to health, 2) percent impairment while working due to health, 3) an overall percent work impairment score due to health, and 4) a percent activity impairment due to health.[40]

One item of the WPAI is: "During the past seven days, how much did your health problems affect your productivity while you were working?" This item can be varied to assess selected health problems, as well as nonwork activities (personal communication; Margaret Reilly). Additional questions ask about the number of hours of work attended or missed as well as the impact of health problems on nonwork activities. The scoring algorithm uses the estimates of actual hours present (at work) and multiplies these hours by the assessed degree of impairment to derive an estimate of overall work impairment.

The brief questions on impairment combined with hours of work provide the possibility for a regular, perhaps daily, assessment of overall workplace productivity. On this basis alone, the approach taken by the WPAI provides a useful model and set of items for research in workplace productivity. Furthermore, indicators suggest that the WPAI measure covaries reasonably well with a variety of symptoms of ill health.

There is no attempt to assess the level of work demand—whether cognitive, emotional, or physical—nor the potential variability in this demand. The only measure for workload is the number of hours scheduled to work. This latter measure is a poor indicator of productivity. Yet, this indicator is multiplied by the impairment assessment to produce the WPAI measure of workplace productivity. There have been no results presented to show that this calculated variable correlates with actual work. It is a reasonable hypothetical measure of presenteeism, but without empirical support it remains hypothetical.

The WPAI may be self- or interviewer-administered and has demonstrated reproducibility.[40] For construct validity, the questionnaire measures were correlated with SF-36 domains and measures of disease/symptom severity. However, to date, no research demonstrates that the impairment scores correlate with the actual work performed. Patients' workplace productivity loss can be monetized using the WPAI.

Challenges and Opportunities in Health-Related Workplace Productivity Measurement

It is important to note that the developers of the health-related workplace productivity instruments reviewed in this article had a very limited time to respond to requests for detailed analyses. We are grateful to the developers of these health-related workplace productivity instruments not only for being pioneers in this health care industry segment but also for their cooperation in supplying information and data about their instruments. Without the cooperation of the developers, this expert panel review would not have been possible.

We recognize, however, that reliance on information from a variety of disparate analyses created a limitation in the present study. Key characteristics of instruments to measure health-related workplace productivity loss have been included in the analyses reported here, but not all relevant work environments, work types, occupations' businesses, and other important factors could be considered. For example, there was no standardization on disease types or severity of impairment among participants across the various studies. While a comparison of the instruments has been made, it has not been possible to report results for a single employee sample responding to all the instruments that are currently under review. In a future study, it would be worthwhile to conduct such a test to produce a direct comparison of the instruments, holding constant the health impairments experienced by the participants.

All of the outlined instruments appear to be sensitive for use with individuals with chronic health problems. However, the versions of the response scales reviewed for this paper generally seem to lack the necessary sensitivity to detect slight degrees of impairment in an essentially healthy working population. An important recommendation to instrument developers is to consider the possibility of developing separate, parallel tools for both healthy and chronically ill groups of workers. Such tools could be administered in a single instrument using filter questions to direct respondents to the appropriate section of the instrument asking about: 1) minor, short term, and highly variable health problems or 2) more severe or chronic health impairments.

All of the instruments have used a retrospective assessment of impairment. To improve sensitivity prospectively, the use of a daily employee diary might supplement findings used in conjunction with a standardized instrument administered before and sometime after a health management intervention. Two to four questions reported one time per day and collected for several weeks during the intervention would yield change data that might permit an examination of individual employees' levels of performance. By measuring changes in individual employee health and productivity, business owners and managers

would be able to track the day-to-day impact of interventions designed to reduce presenteeism and to improve overall workplace productivity. While this approach may seem to be impractical for some businesses, a brief (5 minutes or less) daily assessment could develop very useful information to evaluate the effectiveness of a particular health management intervention.

The assessment of productivity is affected by both the performance of the assessment instrument and the context in which the instrument is embedded. Self-assessment offers several challenges as employees interpret and respond to the tool. They are asked to rate personal performance in relation to a health issue and will respond reflecting their own work experiences, concerns, and potential biases. The assessment of decreased productivity as a result of a health impairment requires several distinct evaluations by employees, including:

- Assessment of the workload, work demands, and workplace distractions;
- Varying level of productivity in response to variations in workload;
- Health problem, including type and severity of, and fluctuation in degree of impairment; and
- Varying impact of the health problem on work effectiveness.

Some of the instruments discussed in this paper attempt to measure all of the preceding factors in a single item. This strategy is probably unrealistic and may produce unreliable results. Thus wherever possible, self-report measures should be cross-validated with other workplace assessments. Pairing performance assessments with an evaluation of the problems in the work environment forges a partnership between worker and management. Such an approach is likely to be viewed much more positively than an instrument that may be perceived to blame employees for decreases in performance. Finally, assessments of all the major factors that are involved in productivity improve the likelihood that business owners and managers will be able to estimate monetary savings or losses associated with changes in productivity.

Therefore, we encourage the developers of health-related workplace productivity measurement instruments to build on the good work that has been started in this field. The limitations described above are normal in this phase of the research and they point to the next steps: 1) refinements in the structure and the use of these instruments, 2) improvements in the science, and 3) increased practical utility of these tools.

Recommendations

Recommendation: Overall

In taking note of the preceding outline of the inherent challenges and opportunities in the current state of the art in health-related workplace productivity, it is important to resist the tendency to rate the instruments reviewed in this article under a single rubric of "reliable/not reliable" or "valid/not valid." Each instrument has strengths and weaknesses. The important question to ask is what efforts are underway to eliminate the weaknesses and to improve the overall quality of the instrument? There is no perfect solution to measuring productivity, whether or not in the context of a health impairment; what is important is an effort toward continuous improvement of the measures. Researchers who are considering the use of one or more of the instruments discussed here should be prepared to conduct their own confirmatory analyses.

Recommendation: Elements of Health-Related Workplace Productivity Measurement

In assessing health-related workplace productivity instruments, the following are the key elements of productivity that should be included and measured by the tool: absenteeism, presenteeism, and employee turnover and replacement costs (Table 1).

Recommendation: Key Characteristics of Health-Related Workplace Productivity Measurement Instruments

The selection of an instrument to assess health-related productivity loss should include the following key characteristics: have supporting scientific evidence, be applicable across work settings and occupations, support effective business decision-making, and be practical in its ease and cost of administration (Table 2).

Recommendation: Health-Related Workplace Productivity Measurement Instruments

To assess health-related productivity loss across a wide range of disease states, industries, and occupations, the following instruments are recommended (listed in alphabetical order): 1) EHC of Tampa Assessment Instrument, 2) HPQ, 3) SPS-6, 4) WLQ, and 5) WPAI.

Recommendation: Migraine-Specific Workplace Productivity Measurement Instruments

To assess health-related workplace productivity loss for patients with migraine headaches, the following instruments are recommended (listed in alphabetical order): 1) EHC of Tampa Assessment Instrument and 2) MWPLQ.

Recommendation: Future Research Investigations

The expert panel identified areas within the field of health-related workplace productivity measurement for further study. The suggested areas include: 1) the identification of the necessary metrics for effective business decision-making and the explicit incorporation of those metrics into workplace productivity measurement tools, 2) the creation of a standardized definition of employee turnover and replacement

costs, and 3) the examination of the impact of an individual's absenteeism and presenteeism on team dynamics and interdependent workgroups within the work environment.

Discussion

The American College of Occupational and Environmental Medicine undertook this project to establish health-related productivity measurement criteria and to identify the means of assessing the individual and organizational impact of migraine headache. In addition, it is hoped that this effort will assist employers and health care decision-makers in developing sustainable strategies to measure the impact of migraine headache on workplace productivity loss. Employers need to have a better understanding of the impact of medical conditions such as migraine headache on employees' productivity to assist in more knowledgeable and effective decision-making regarding their investment in health-related productivity improvement initiatives.

For those employers wishing to implement a health-related productivity measurement program within their company, this project provides information to help determine the instrument most appropriate for their program. This project draws on not only the medical literature for information on the currently available health-related productivity measurement tools, but also on the latest data from the developers of the identified instruments. This provides unique data not found elsewhere.

Each corporation must assess their organizational and business models to determine the applicability of a specific health-related workplace productivity measurement instrument for its particular work environment and culture.

Finally, this review applies to the current state of health-related workplace productivity measurement instruments. However, health and productivity measurement is a dynamic and rapidly developing arena with current measurement tools being revised and new tools being created on a regular basis. Therefore, further work is needed to continually investigate, review, and evaluate these tools and determine which instruments may best help employers to estimate their health-related productivity losses among their employees. Furthermore, we encourage the developers of productivity measurement tools and instruments to continue to uphold an appropriate level of scientific rigor when considering all of the elements of productivity measurement in Table 1 and the key characteristics of productivity instruments listed in Table 2 when revisions are performed or new tools are designed. This will continue to strengthen the discipline of health-related productivity interventions and allow them to be built on sound scientific and economic measurements for the benefit of employee health and the employer bottom line.

Conclusions

In this report, the American College of Occupational and Environmental Medicine's Expert Panel has identified the necessary elements of health-related productivity measurement that should be captured, provided key characteristics for evaluating health-related workplace productivity instruments, and recommended health-related productivity instruments for measuring employees' work loss. In addition, the expert panel has posed future areas of research with the field of workplace productivity measurement.

The field of health-related productivity measurement is dynamic. As the state of the art of human capital management progresses, increased sophistication in understanding, measuring, and managing productivity will also be enhanced. Continued study, refinement, and on-going evaluation of health-related productivity measurement instruments are needed. By doing so, these instruments will be able to be used with confidence to measure the impact of health-related workplace interventions and thereby yield a foundation of support, based on the pillars of solid scientific and economic results, in building the compelling business case for investing in improvement of health and human performance.

The health and productivity of the workforce is inextricably linked. Therefore, we believe there needs to be a clarion call to action regarding health-related productivity that integrates health strategies and business strategies in rational ways, contributing to a healthier nation and a healthier economy.

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