

Assessing the Impact of Cancer on Work Outcomes

What Are the Research Needs?

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Cancer survivorship research seeks to improve the physical, psychosocial, and economic outcomes of individuals who have a history of cancer.¹ For working-age adults with cancer, work impairment may be one of the most burdensome consequences of cancer. Inability to return to work after cancer treatment, frequent or prolonged work absenteeism, or problems with work performance may have substantial economic impact on the survivor and her or his family.²⁻⁵ Changes in work also may have substantial impact on self-esteem, quality of life, and social or family roles.⁶⁻¹⁰ Finally, work performance after cancer treatment may be a measure of recovery in its own right.

Despite its importance, the impact of cancer and its treatment on work has been studied infrequently. Spelten and colleagues reviewed the literature through 1999 and concluded that critical questions, such as the impact of different cancer sites on work and the extent of racial or socioeconomic disparities in work function after cancer, have rarely been addressed.¹¹ Furthermore, the existing literature rarely has identified remediable targets for intervention and has lacked rigorously tested intervention strategies to increase return to work or work function.

More and better research on the work impact of cancer is necessary to inform the decisions of cancer survivors and their treatment providers. In this commentary, we examine the characteristics of research studies that may advance our understanding of this important clinical and social issue. To achieve this objective, we identify six methodologic attributes that provide the solid scientific knowledge necessary to inform interventions, evaluate existing studies in the light of these criteria, and propose a conceptual model to guide future research.

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Identification of Studies

We reviewed the published, English-language literature from 1966 to 2003 to identify studies that addressed the impact of cancer on work, updating the review of the literature through 1999 by Spelten and colleagues.¹¹ We identified relevant studies by searching the MEDLINE, CancerLit, EMBASE, HealthSTAR, PsychoINFO, ERIC, and Social SciSearch electronic data bases and identified secondary sources by searching the reference sections of relevant articles and reviews. We included studies that enrolled adult cancer survivors of working age (≥ 18 years) and focused on self-reported or independently assessed measures of work outcomes after the diagnosis of cancer. Studies of adult survivors of childhood cancer were excluded from the review, as were secondary data analyses and qualitative studies. We did not evaluate studies that assessed work function in the context of a broader assessment of quality of life after cancer, because they often included unpaid work or assessed work only as a small component of the research question. After relevant studies were identified, one reviewer (T.A.C.) abstracted data from each study that were verified independently by a second reviewer (D.S.M.).

Methodologic Criteria for Studies of Work after Cancer

To guide the data abstraction, we prospectively established six methodologic criteria to evaluate studies of the impact of cancer on work outcomes based in part on established criteria for the validity of observational study designs.^{12,13} The criteria described in the following paragraphs were used.

A study design that includes the enrollment of a *population-based* sample of cancer survivors, ideally using a cancer registry or similar source to identify patients, helps avoid selection bias that can arise from the assessment of patients who receive treatment at a single site, such as an academic cancer referral center. This design feature also helps assure that the work experiences of cancer survivors of lower socioeconomic status or who lack private health insurance is assessed. Using representative samples also helps define differences in work outcomes between groups based on age, gender, prognosis, ethnicity/race, and occupational type.

A *prospective and longitudinal* assessment of an *inception cohort* of cancer survivors, beginning as close as possible to the time of cancer diagnosis and initial treatment, allows assessment of both the short-term and long-term impact of cancer on work and assures that the work experience of individuals who have a poor prognosis is assessed. Retrospective eval-

uations of the work experience of long-term cancer survivors are susceptible to selection bias and recall bias. Furthermore, retrospective assessment complicates the measurement of work, because multiple job changes may have occurred since cancer diagnosis, some of them possibly unrelated to cancer. Work function should be assessed wherever possible at common time points to allow comparisons of the trajectory of recovery between studies and across cancer sites. Comparisons between cancer survivors and a cohort of individuals without cancer can distinguish the impact of cancer from other influences on work, such as age, comorbid health conditions, and secular changes in the job market and in economic conditions.

A *detailed assessment of work intensity, role, and content* is important, because paid work is a complex process. Individuals may work full-time or part-time, seasonally or year-round; they may be self-employed, and they may have concurrent jobs that impose different physical and cognitive demands. The impact of cancer on work function also can be complex. After diagnosis or treatment, individuals may be unwilling or unable to return to the job they held previously, yet they may be eager or compelled to work in some other capacity. Thus, simply reporting the proportion of patients who return to some form of paid work after cancer provides an incomplete assessment of the impact of cancer on work. Information about the type, amount, content, physical demands, and cognitive demands of work is helpful in assessing the work impact of cancer in a comprehensive way. A comparison of aspects of work, such as hours worked, job duties, productivity, and attitudes about work, at multiple time points after the diagnosis of cancer may help identify the impact of cancer on work in both the short term and the long term.

The impact of cancer on the *economic status* of the individual and the family should be assessed, because decisions about work after cancer are likely to be influenced profoundly by financial considerations. Individual income is an important part of this assessment. However, the income of spouses or of other family members who provide financial support for the patient and the potential economic impact on those family members or dependents also may be critical to the cancer survivor, the family, and society. Closely related issues, such as the amount of disability benefits to offset lost income, also should be assessed.

Multidimensional *moderators of work return and work function* should be identified, particularly those that are susceptible to intervention. Characteristics of the cancer itself (such as site, stage, prognosis, and symptoms), the treatment (such as side effects of sur-

gery, radiation, or chemotherapy), the patient (such as age and physical and mental comorbidities), the social and family structure (such as social supports, other workers in the home, the presence of dependents, and the availability of health insurance for the cancer survivor and her or his family), and the impact of cancer on personal growth, values, and professional goals¹⁴⁻¹⁸ all may affect work decisions.

Although the *sample size* for any study depends on the anticipated incidence of the work outcomes of interest and the number and prevalence of moderators assessed, studies of work after cancer should define a cohort of survivors that is sufficiently large to allow multivariate statistical analysis. Studies also should contain a sufficient number of survivors in relevant subgroups, such as specific cancer sites or stages or racial and ethnic minorities, to provide prognostic information to survivors and clinicians. Men and women should be analyzed separately for labor market outcomes; therefore, samples have to be of sufficient size for both genders.

Assessment of the Literature

We identified 18 studies that had a primary focus on work outcomes of cancer survivors and that met our criteria for evaluation.^{5,19-35} Of these, eight studies had been included in the review of the research in this area through 1999,¹¹ three studies were published before 2000 but were not included in that article, and seven studies have been published since that time.

Table 1 summarizes the adherence of the 18 studies to the 6 methodologic criteria we proposed. The studies satisfied a mean of 2.2 ± 1.4 of those criteria, and only 4 studies met ≥ 4 criteria. Those four studies can be used to illustrate important findings and some of the current gaps in the literature on work return and work function after cancer.

Three of the four studies were population-based, drawing from cancer registries in the United States.^{20,24,31} Consequently, the impact of sociodemographic variables, such as race/ethnicity and income, on work return could be assessed. In one study, an apparent association between black race and a delay in return to work among women with breast cancer disappeared after adjustment for physical and job characteristics,²⁰ whereas two studies found no relation between work return and income prior to the diagnosis of cancer.^{20,24}

Two of the 4 studies enrolled a prospective cohort of cancer survivors within 6 months of diagnosis,^{20,33} but only 1 study measured work return at multiple time points.³³ That study, which was from the Netherlands, assessed return to work using survival analysis and found that 24% of survivors who were working

at the time of diagnosis had returned to work by 6 months, whereas 64% had returned by 18 months after diagnosis. One problem with retrospective assessment of the work experience of long-term cancer survivors was illustrated by the study of Bradley and Bednarek,³¹ who sampled patients from the Detroit Surveillance, Epidemiology, and End Results Registry 5-7 years after diagnosis but were able to recruit only 35% of the patients sampled.

Three studies assessed whether patients returned to work at all (as a dichotomous [yes or no] variable),^{20,31,33} and three studies assessed some other aspects of work function^{20,24,31} (e.g., physical requirements, work dysfunction, job characteristics, hours worked per week). The proportion of patients returning to work was 72% among women with breast cancer at 3 months,²⁰ 64% among a sample with a range of cancer sites at 18 months,³³ and 67% of long-term survivors with breast, lung, prostate, or colon cancer at 5-7 years.³¹ Because approximately two-thirds of each study sample had returned to work at the time of assessment, these reports suggest that many cancer survivors can return to work successfully. Two studies found that cancer survivors were less likely to return to a job with high physical demands,^{20,24} and two studies found that problems with work function persisted even among those who did return to work.^{24,31}

Only one of the four studies assessed the economic consequences of the decision to return to work on the survivor and his or her family.³¹ In that study, the authors found that long-term survivors worked an average of > 40 hours per week and had average wages similar to individuals without cancer in the Detroit metropolitan area. A minority of patients in that study reported that their family members quit their own jobs or reduced their work during the period of cancer treatment.

All four studies assessed multiple moderators of work return and work function, including sociodemographic features,^{20,24,31,33} cancer site and stage,^{20,24,31,33} treatment modalities,³¹ concurrent mental health problems,²⁴ physical symptoms,^{20,24,33} functional health status,^{20,33} or some aspect of social support.^{20,31} The studies did not use either a common set of moderators or consistent measures of those moderators, however. Consequently, the conclusions of the studies are difficult to summarize. Physical symptoms were important predictors of work return or work function in two studies,^{24,33} but not in a third study.²⁰ Functional limitations and different cancer sites (but not always cancer stage) consistently were predictive of subsequent work in the studies that assessed those characteristics.^{24,31,33}

The 4 studies ranged in size from 235 to 296 sur-

TABLE 1
Methodological Criteria for Studies of Work Outcomes after Cancer

Study/study design	No. of patients	Patient population and case ascertainment method	Recruitment sites/population-based status	Economic impact assessed?	Aspects of work assessed	Moderators assessed	Criteria met ^a
Studies that met ≥ 4 of 6 methodologic criteria							
Bradley and Bednarek, 2002 ³¹ (cross-sectional survey)	253	Long-term survivors (5-7 yrs) only; consecutive sample	Population-based tumor registry	Yes	RTW rate, employment, status, weekly hrs worked, reduced work schedule, earnings, household income, reasons for not working, absenteeism, job changes, health insurance, retirement issues, future employment outlook, physical requirements at work	Family structure, issues regarding retirement, stage at diagnosis, treatments received, recurrences, employment patterns of spouses/partners, physical limitations	1, 3-6
Spelten et al., 2003 ³³ (prospective cohort)	235	Inception of care; consecutive sample	Three hospitals	No	RTW rate, workload, work stress, work hrs, time taken to RTW	Clinical factors (diagnosis, treatment); cancer-related symptoms (fatigue, depression, sleep problems, physical symptoms, cognitive dysfunction, psychological distress)	2, 3, 5, 6
Satariano and DeLorenze, 1996 ²⁰ (cross-sectional survey)	296	Within 3 mos of diagnosis; consecutive sample	Population-based tumor registry	No	RTW rate, employment in jobs requiring physical activity	Physical symptoms that limit daily activities; limitations in upper-body strength; depression; fatigue; nausea; leg cramps; ankle, joint, and back pain; chest soreness and pain; marital status and employment status of husband; transportation needs	1, 2, 5, 6
Greenwald et al, 1989 ²⁴ (cross-sectional survey)	247	All survivors	Population-based tumor registry at a major cancer center	No	Job characteristics (time discretion, skill discretion, physical demands); work dysfunction	Physical and emotional impact, tension, depression, pain	1, 3, 5, 6
Studies that met < 4 of 6 methodologic criteria							
Abrahamsen et al., 1998 ¹⁹ (cross-sectional survey)	459	Long-term survivors only; consecutive sample	One major cancer center	No	RTW rate, professional plans and career, length of disability after first-line treatment, work status at diagnosis and at time of survey data collection, reasons for not being employed, profession	Sexual dysfunction, fertility, family life, marital status, depression, anxiety, fatigue	3, 5, 6
van der Wouden et al., 1992 ²³ (cross-sectional survey)	649	Long-term survivors only; consecutive sample	Population-based	No	RTW rate, full-time vs. part-time RTW, absenteeism and impediments at work after RTW, employment and income (precancer and postcancer), change in work status	Perceived consequences of the disease or treatment, relationships with family and friends, leisure activities	1, 3, 6
Goldberg, 1975 ²⁷ (prospective cohort)	62	Inception of care; consecutive sample	One VA hospital	No	RTW rate; predisability occupational data (work status, work history, educational and vocational plans; time productively employed, job changes, no. of job hrs; work values, acceptance of responsibility); postdisability occupational data (similar to constructs for predisability data)	Severity of cancer, type of treatment, presence of speech, remotivation, realism, rehabilitation outlook	2, 3, 5

(continued)

TABLE 1
(continued)

Study/study design	No. of patients	Patient population and case ascertainment method	Recruitment sites/population-based status	Economic impact assessed?	Aspects of work assessed	Moderators assessed	Criteria met ^a
Schultz et al., 2002 ³² (cross-sectional survey)	4364	Long-term survivors only; consecutive sample	One major cancer center; 2) survey posted on a cancer-related website	No	Work status, job discrimination	Impact on overall health, family relationships, and intimate relationships	5, 6
Weis et al., 1994 ³⁵ (cross-sectional survey)	566	Completion of rehabilitation program; consecutive sample	Two rehabilitation clinics	No	Work status, changes in work situation, vocational integration, work-related problems, limitations in work performance and occupational status	Diagnosis, prognosis	3,6
Bloom et al., 1988 ³⁰ (cross-sectional survey and qualitative interview)	85	All survivors < 5 yrs since diagnosis; convenience sample	One hospital	No	RTW rate, employment status, income, discrimination regarding employee benefits, relationships with coworkers and others, job-related performance, job limitations, work-related physical activities	Stage of disease at diagnosis, type of treatment received, medical status, health status, recall, understanding, and perceptions of treatment, ability to participate in leisure-time activities, psychosocial distress, emotional support, social health	3, 5
Chirikos et al., 2002 ³ (cross-sectional survey [with comparison group])	105	Long-term survivors only (> 5 yrs); consecutive sample	Major cancer center	Yes	Changes in work effort, pay rates, and annual earnings, changes in household earnings, income, and assets		4
Hinman, 2001 ²⁹ (cross-sectional survey and qualitative interviews)	31	All survivors for > 2 yrs since diagnosis; consecutive sample	One major cancer center	No	Work status (presurgery and postsurgery), physical requirements of job	Length of hospital stay, type and length of postoperative rehabilitation program	3
Hounshell et al., 2001 ³⁴ (cross-sectional survey)	31	Long-term survivors only; consecutive sample	One major cancer center	Yes	Employment status, health insurance, income, finances, life insurance history	Changes in lifestyle habits (exercise, eating habits, use of vitamins or nutritional supplements, use of alternative medical practitioners, use of psychologic counseling)	4
Stewart et al., 2001 ²⁸ (cross-sectional survey)	378	Long-term survivors only; convenience sample	Two cancer clinics and 28 community support groups	No	Effect on work, insurance benefits	Effect on family life, confidentiality, disclosure	6
de Lima et al., 1997 ²⁵ (cross-sectional survey)	170	Long-term survivors only; consecutive sample	One major cancer center	No	RTW rate, work status (precancer and current), precancer occupation	Physical limitations	3
Razavi et al., 1993 ²¹ (cross-sectional survey)	41	All survivors; consecutive sample	An oncology outpatient clinic	No	RTW rate	Anxiety, depression, treatment toxicity, time elapsed since end of treatment, disease stage disease recurrence, cancer type	5
Bergman and Sorenson, 1987 ²⁶ (prospective cohort)	44	Consecutive sample	One hospital	No	RTW rate, work status, physical requirements of work (light vs. heavy)	Disease stage at diagnosis	2
Bushunow et al., 1995 ²² (cross-sectional survey)	145	Long-term cancer survivors only; consecutive sample at a single institution	One community hospital	No	RTW rate after surgery difficulty in employment due to cancer	Type of treatment	None

RTW: return to work; VA: Veterans Administration.

^a Methodologic criteria were as follows: 1) population-based sample status, 2) prospective and longitudinal nature, 3) inclusion of a detailed assessment of work, 4) inclusion of an assessment of the impact of work on the economic status of the individual and the family, 5) inclusion of a multidimensional assessment of moderators of work return and work function, and 6) large sample size.

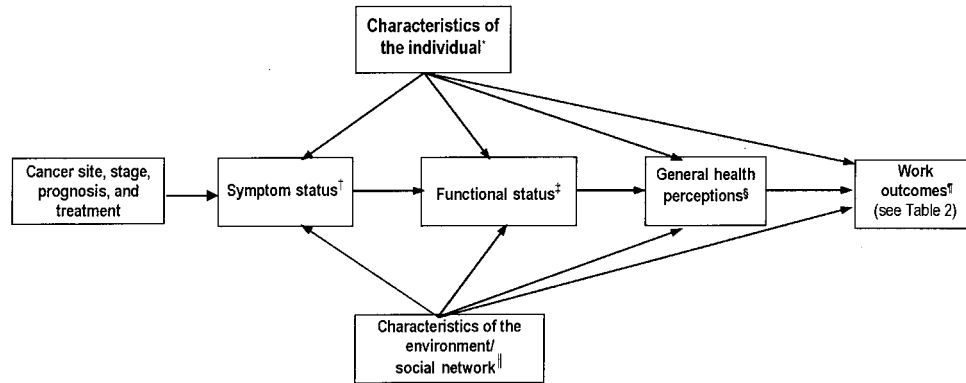


FIGURE 1. Relationship between cancer, quality of life, and work outcomes. *Includes sociodemographic characteristics, personal goals and values, baseline physical and mental comorbidities, and perceived importance of work. †Examples include presence or absence of fatigue, presence or absence of pain, and presence or absence of dyspnea. ‡Includes presence or absence of various physical and mental health limitations. §Includes self-rating of overall health, among other self-perceptions. ¶Work outcomes are described in detail in Table 2. ||Includes social support, presence or absence of dependents, and need to maintain health insurance. Model adapted from Wilson and Cleary, 1995.³⁶

vivors, a sample sufficiently large for multivariate analysis. Three of the studies included patients with multiple sites of cancer,^{24,31,33} whereas one study only included patients with breast cancer.²⁰ In the studies with multiple sites, some differences in work performance between cancer sites were found, but the number of patients with any individual disease site was too small to provide useful prognostic information to cancer survivors or clinicians about the likelihood of work return.

In summary, most of the literature on work return and work roles after cancer has had important methodologic limitations, as shown in Table 1. Most of the studies in this area have been from single referral centers, enrolled only long-term cancer survivors, included homogeneous samples with respect to race/ethnicity, and may have emphasized the work experience of survivors with higher socioeconomic status. Furthermore, those studies typically assessed only whether the survivor returned to any form of paid work, without assessing alterations in the content of work, work hours, or the economic impact of cancer on the individual and the family. Even the four studies that meet four or more of the six methodologic criteria we have proposed^{20,24,31,33} leave many unresolved questions about the impact of cancer on work return and work function. Among these questions are the extent of racial, ethnic, or socioeconomic disparities in work function after cancer; the extent to which individuals with a poor prognosis choose and are able to return to work (even if for a short time); and the relative importance of different types of moderators on work return.

A Conceptual Model of Work after Cancer

Only one study of work after cancer reported an explicit model that guided the assessment of work or the moderators of work function after cancer.³³ We propose a more detailed model shown in Figure 1, which was drawn from the existing literature and from a more general model of the relation between clinical variables and health-related quality of life.³⁶ This model suggests that standard clinical variables (cancer site, stage, and treatment) lead to physical symptoms due to the cancer or its treatment, which, in turn, may affect the functional status of the survivor; their general health perceptions (defined as the personal integration of all the prior considerations³⁶); and, ultimately, their work outcomes. The elements in this sequence of events can be modified by characteristics of the individual (sociodemographics, medical comorbidity, personal goals), and the environment (social supports, the presence of dependents, the need to maintain health insurance). Although the linkages between aspects of this model may be complex, the model provides a preliminary guide for the choice of domains to assess and the relations between them.

Many of the elements in this model were assessed to a limited degree in the 18 studies we evaluated; a few of those associations are described above. Some of the proposed elements have not been evaluated in existing research. For example, researchers in psychosocial oncology in the last decade have described the process of benefit-finding that commonly occurs among cancer survivors.¹⁴⁻¹⁸ The impact of personal growth or benefit-finding on work decisions in response to cancer has not been assessed. No study has integrated information from all domains into a com-

TABLE 2
Work Outcomes after Cancer Diagnosis/Treatment

Outcome domain/variables
Working
Yes
No
Work intensity
Hrs per week
Change in job schedule (e.g., irregular schedule)
Change in work status (e.g., full-time to part-time)
Work role and content
Change in employer
Change in work type
Change in job title
Change in work duties or skills
Change in work productivity
Change in job satisfaction
Change in value of work
Change in retirement plan
Ability to change jobs after cancer
Economic status
Change in wages and other personal income
Change in spouse's/partner's income
Financial incentives/disincentives to RTW
Amount of health insurance benefits
Amount of disability insurance benefits

RTW: return to work.

prehensive assessment of the influences on work function after cancer.

Much of the assessment of moderators of work return has been incomplete, in that prior studies typically have adopted a simplistic approach to measuring work. Table 2 shows that a comprehensive assessment of work after cancer would entail the assessment of multiple work domains (intensity, role, content, and economic status) rather than only *return to work* as a dichotomous outcome. Standardized instruments to assess some these components of work have been developed in recent years for other health conditions,³⁷⁻⁴⁰ but they have not been validated or used in cancer survivors. Systematic evaluation and consistent use of these measures across studies would facilitate comparisons of the impact of different cancer sites and treatment settings. Finally, workplace accommodations after cancer need further study as potential environmental moderators. Little is known either about adaptations in the physical workplace or the content of work that may ease the return of cancer survivors to full participation in the work force or about the downstream impact of returning cancer survivors on the employer. One study, for example, has suggested that women with breast cancer who return to work actually work *more* hours than an age-matched and gender-matched control group.⁴¹

Identification of Remediable Risk Factors

Ultimately, research on work after cancer should be dedicated to identifying impediments to optimal work outcomes that may be overcome by specific interventions. Some important predictors of work outcomes in cancer survivors, such as age, family structure, economic needs, and the site or stage of cancer at diagnosis, cannot be affected directly by work-related interventions. In contrast, symptoms such as pain or fatigue; functional impairments, such as muscle weakness, neuropathy, or depression; and social/environmental impediments, particularly in the workplace itself, are possible candidates for intervention. If common, remediable barriers are found that affect survivors across multiple cancer sites, then systematic assessment and treatment trials can be carried out. These interventions may take the form of alterations in the cancer treatment regimen to minimize work-impeding side effects; better treatment of symptoms or concurrent health conditions, such as depression; programs of physical rehabilitation to restore strength and mobility; or occupational rehabilitation in health care settings or in the workplace itself. An example is fatigue, which affects many cancer survivors^{33,42-44} and may respond to pharmacologic interventions or physical rehabilitation programs.⁴⁵⁻⁴⁷ Interventions to reduce fatigue and their impact on work have been reported^{42,48,49}; however, many of those studies were case series rather than randomized trials. If clinical, social, and economic variables are not strongly predictive of work outcomes, then appropriate interventions will need to involve individualized assessment and problem solving, leading to the development of tailored treatment and rehabilitation strategies.

Work after cancer is highly desirable from a social and economic perspective.^{2,5,41,50,51} To the extent that work is associated with enhanced self-esteem and quality of life,^{52,53} interventions to enhance work function after cancer also may benefit the individual. Intensive and potentially costly interventions are likely to be justifiable only if they have a substantial impact on workplace and economic productivity and on the quality of life of the cancer survivor. Further work in this area also must take into account the possibility that, for some individuals, the decision *not* to return to work may be the optimal outcome if that choice results from a reassessment of life goals. Cancer may provide the impetus to retire from an undesirable job or to choose a new line of work that is more satisfying personally but less lucrative. For this reason, work function after cancer must be assessed in the context of the individual's priorities and values, rather than exclusively using social or economic metrics.

Conclusions

Work is important to the individual, to his or her family and social network, to the employer, and to society at large. We screen working-age people as a policy, but we do not understand entirely the outcomes of detection and treatment. It becomes increasingly important, as survival after cancer treatment continues to lengthen,¹ to assess the impact of cancer diagnosis and treatment in broad personal and social context, to evaluate the impact of cancer treatment on these contextual factors, and to design interventions to restore the individual to optimal function. Because the ability to work integrates so many physical, mental/cognitive, social, and economic considerations, observational studies of the impact of cancer on work and interventions to improve work function are a particularly important component of cancer survivorship research. Research in this area has been impeded by weak research designs, lack of validated and standardized measures, failure to assess important moderators consistently, and haphazard measurement of work outcomes. Guided by an empirically validated conceptual model and facilitated by improved measurement tools, research on the work outcomes of cancer holds substantial promise to mitigate the economic impact of cancer and to improve the quality of life of cancer survivors.

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