In the current issue of Circulation Cardiovascular Quality and Outcomes, Zullig et al\(^{1}\) report an association between perceived life chaos and medication nonadherence among patients who had a history of acute myocardial infarction and hypertension within the previous 3 years. Patients were enrolled in the ongoing Secondary Prevention Risk Interventions via Telemedicine and Tailored Patient Education (SPRITE) trial. SPRITE is a 3-arm randomized trial evaluating the effects of a nurse-delivered, telephone-based patient education intervention versus a web-based patient education intervention versus usual care on systolic blood pressure and other cardiovascular risk factors.\(^2\)

The investigators conducted a cross-sectional study of baseline data from 406 patients enrolled in the SPRITE trial. They administered a 6-item version of the Confusion, Hubbub, and Order Scale (CHAOS), which includes the following items\(^1\): (1) My life is organized. (2) My life is unstable. (3) My routine is the same from week to week. (4) My daily activities from week to week are unpredictable. (5) Keeping a schedule is difficult for me. (6) I do not like to make appointments too far in advance because I do not know what might come up. Items were rated on a 5-point Likert scale (from definitely true to definitely false), and total scores ranged from 0 to 30, with higher scores indicating greater perceived chaos. Patients also completed a Likert scale variation of the original 4-item (yes/no) Morisky medication adherence scale.\(^4\) After adjustment for demographic and socioeconomic factors, each 1 point increase on the CHAOS was associated with a 7% increase in medication nonadherence (odds ratio, 1.07; 95% confidence interval, 1.02–1.12).

Medication adherence is a growing problem among patients afflicted with cardiovascular disease and is of great concern because it not only has an impact on patient outcomes but is also associated with higher costs of care.\(^3\) The degree of nonadherence measured in this study was high, with almost half of patients reporting problems adhering to their cardiovascular disease medications. Also evident from this study was that many patients were struggling to keep a schedule and found their lives disorganized. These are all important findings and suggest that novel strategies are needed to improve psychosocial support and enhance medication adherence among patients with cardiovascular disease.

Early identification of patients with psychological challenges and provision of appropriate follow-up may improve health behaviors and adherence to medical therapies. In the long run, identification and treatment of psychological problems could potentially introduce cost savings by reducing secondary events. However, challenges include the fact that access to social work services or psychosocial counseling services may not be available because of the many demands that these services are already facing and their underrepresentation in many medical facilities. It would be interesting to study whether promoting access to these services and programs could eventually pay off by preventing secondary events and re-admissions.

The importance of perceived life chaos and the novelty of this concept are, however, less clear. It is well known that psychosocial factors are associated with medication nonadherence in patients with cardiovascular disease, and that medication nonadherence is a risk factor for adverse cardiovascular outcomes.\(^5\) Some of the items in perceived life chaos have substantial overlap with related psychological concepts such as locus of control (ie, the extent to which a person believes that he or her actions will be effective in controlling or mastering the environment).

An individual with an external locus of control believes that life is controlled by external factors they cannot influence. An individual with an internal locus of control believes that he or she has control over the environment.\(^6\) Another related personality trait is conscientiousness (ie, the ability to be responsible and self-disciplined), which is not surprisingly linked with positive health outcomes, including better medication adherence.\(^9\)

Perceived life chaos also has substantial overlap with symptoms of anxiety and depression (eg, my life is unstable; keeping a schedule is difficult for me). All the other patient characteristics associated with perceived life chaos (female sex, minority race, education less than a high school, low health literacy, inadequate financial status, and not being married) have been linked with depression and anxiety in previous studies. However, Zullig et al\(^{1}\) did not adjust for depressive symptoms, anxiety symptoms, perceived stress, or any other psychosocial characteristics. This raises questions about whether perceived life chaos was independently associated with medication adherence.

Apart from its conceptual clarity, the construct of perceived life chaos may also benefit from further validation work in the cardiovascular setting. The original CHAOS...
was a 15-item, self-report questionnaire administered to parents for the assessment of environmental confusion in child development studies. A shortened 6-item version was later developed for HIV-infected adults (and has now been administered in the SPRITE trial). In 220 HIV-infected adults, higher scores on the 6-item CHAOS were associated with lower scores on the mental component summary score of the Medical Outcomes Study Short Form-12. However, internal consistency of the CHAOS was relatively weak (Cronbach $\alpha$, 0.67), and the instrument has not been validated in other patient populations. Although internal consistency for the current study was good (Cronbach $\alpha$, 0.92), further validation work is needed.

Finally, the 43% prevalence (174 of 406) of nonadherence was unusually high, especially for patients enrolled in a clinical trial. The investigators administered a Likert scale variation (ranging from strongly disagree to strongly agree) of the original Morisky (yes/no) scale: (1) Do you ever forget to take your medicine? (2) Are you careless at times about taking your medications? (3) When you feel better, do you sometimes stop taking your medicine? (4) Sometimes if you feel worse when you take the medicine, do you stop taking it? Nonadherence was defined based on the responses to Strongly Agree, Agree, Don’t Know, or Refused (versus Disagree or Strongly Disagree) to any of the 4 items. If a response was missing for any of the 4 items, then the nonadherence variable was considered missing. It is unclear why patients who responded Don’t Know or Refused were considered nonadherent, whereas patients with a missing response to 1 of the 4 items were excluded from the analysis and how this may have impacted their results.

In summary, Zullig et al found that perceived life chaos is associated with medication nonadherence among patients with a history of myocardial infarction and hypertension. It is unclear whether this finding was independent of depression and anxiety. Nonetheless, the present results underscore the importance of psychological distress and the ability to organize one’s life in the context of a chronic disease, as well as the critical role of psychosocial support in any self-management intervention designed for patients with cardiovascular disease.

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**Disclosures**

None.

**References**


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