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Journal of the American Pharmacists Association

journal homepage: [www.japha.org](http://www.japha.org)

## ADVANCES IN PHARMACY PRACTICE

## Virtual medication tours with a pharmacist as part of a cystic fibrosis telehealth visit

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## ARTICLE INFO

## Article history:

Received 28 February 2021

Accepted 6 April 2021

Available online 20 April 2021

## ABSTRACT

**Background:** As a result of the coronavirus disease 2019 (COVID-19) pandemic, institutions needed innovative solutions to provide care. With implementation of telehealth, a cystic fibrosis (CF) pharmacist was able to incorporate a virtual medication tour during appointments.

**Objective:** The purpose of our study was to describe the uptake and impact of pharmacist-led virtual medication tours during telehealth visits in the CF clinic setting.

**Practice description:** Before the COVID-19 pandemic, a CF pharmacist participated in in-person multidisciplinary team visits to complete medication history reconciliation, assess adherence, assess efficacy and address possible adverse effects of medications, and work collaboratively with the CF care team and patient to create therapeutic plans. The virtual medication tour described in this study was completed in addition or as a complement to these pre-existing pharmacist roles and responsibilities.

**Practice innovation:** Patients seen via telehealth visit were asked to provide a virtual tour of their medications. A pharmacist completed medication history and evaluated whether storage conditions were appropriate in regard to temperature, humidity, light exposure, and accessibility to children.

**Evaluation methods:** A pharmacist recorded findings from the virtual medication tours and made interventions when appropriate. Descriptive statistics were used for analysis.

**Results:** Of 20 patients seen via telehealth for a quarterly visit during the first 3 months after implementation, 13 were willing to participate in a virtual medication tour. Before the visit, 25% had information missing from their medication list. Virtual medication tour allowed for resolution of this information 80% of the time. Three of the 4 participating patients with a child under 12 years old had medications stored in a location accessible to children.

**Conclusion:** A virtual medication tour led by a pharmacist can be successfully incorporated into telehealth visits and was accepted by a majority of patients. Most patients stored medications appropriately but might benefit from education on poison prevention practices.

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## Background

As a result of the coronavirus disease 2019 (COVID-19) pandemic, there has been a rapid advancement in the uptake of telehealth.<sup>1</sup> Many of the regulations and logistical obstacles surrounding the use of telehealth in pharmacy have been

modified or resolved.<sup>2</sup> Common barriers before the pandemic included inadequate insurance coverage of services, patient discomfort, and fear of inferior care. Despite these potential deterrents, pharmacist–patient interactions via telehealth have been described in outpatient settings and long-term care settings across a variety of patient populations.<sup>3,4</sup> As institutions adapted to the pandemic, there was a resurgence of telehealth and a need to incorporate pharmacists into this care strategy.<sup>5</sup>

Early in the COVID-19 pandemic, University of Chicago Medicine transitioned a majority of appointments to telehealth using a video communication system. This allowed patients to have fewer exposures to the health care system. In

**Disclosure:** The authors declare no relevant conflicts of interest or financial relationships.

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**Key Points****Background:**

- As a result of the coronavirus disease 2019 pandemic, there has been a rapid advancement in the uptake of telehealth.
- Pharmacists in cystic fibrosis care teams play key roles in medication reconciliation, coaching on medication management tasks or medication-related self-care skills, addressing medication burden, access, and cost issues, and improving medication adherence.

**Findings:**

- A virtual medication tour led by a pharmacist can be successfully incorporated into telehealth visits and allows pharmacists to identify opportunities for intervention.

addition, more than 15% of employees were temporarily converted to primarily work-from-home positions. This included a majority of the specialty pharmacy employees. Among this group was the cystic fibrosis (CF) care team pharmacist.

The CF team pharmacist was incorporated into multidisciplinary CF clinic appointments scheduled via telehealth to maintain their previous role at in-person quarterly visits, which included medication history and reconciliation, assessment of medication adherence, review of medication adverse effects, and responding to new patient questions or concerns related to medications. With the transition from in-person to telehealth, the CF team pharmacist was also able to expand their activities to include a virtual medication tour as part of the quarterly appointment. Utilizing technology made it possible to provide a component of care typically only available through home health visits, which can be time-consuming and costly.<sup>6</sup>

The incidence of inappropriate medication storage in the home setting for patients with CF is unknown. However, a Dutch study examining medication storage practices in geriatric patients found that those with 5 or more medications and those with at least 1 medication requiring refrigeration were less likely to be storing their medications as recommended.<sup>7</sup> Further, storing medication in multiple locations throughout the home, instead of having 1 organized location for medications, is associated with poor health outcomes.<sup>8</sup>

**Objective**

The purpose of our study was to describe the uptake and impact of pharmacist-led virtual medication tours during telehealth visits in the CF clinic. The primary outcome was to determine patient willingness to participate in virtual medication tours during telehealth visits. The secondary outcome was to identify potential interventions that could be achieved by incorporating this practice as part of a pharmacist telehealth evaluation.

**Practice description**

Before the COVID-19 pandemic, the CF pharmacist participated in in-person multidisciplinary team visits to complete medication history reconciliation, assess adherence, assess efficacy and address possible adverse effects of medications, and work collaboratively with the CF care team and patient to create therapeutic plans. The virtual medication tour described in this study was completed in addition or as a complement to these pre-existing pharmacist roles and responsibilities in this setting.

There is extensive literature demonstrating the benefits of a pharmacist,<sup>7</sup> and more recently, pharmacy technicians,<sup>9</sup> on the CF care team. This includes the value of a pharmacist in medication reconciliation,<sup>10</sup> coaching on medication management tasks or medication-related self-care skills,<sup>11</sup> particularly in pediatric populations, addressing medication burden, access, and cost issues,<sup>12</sup> and improving medication adherence.<sup>13,14</sup>

**Practice innovation**

There are other descriptions in the literature of virtual medication counseling or comprehensive medication reviews by pharmacists in interprofessional practice models when a pharmacist is not available on-site.<sup>15</sup> However, in these telepharmacy scenarios, the patient and other team members are physically located at an office setting, and the pharmacist is remote. In contrast, we had the opportunity to provide pharmacy services to patients who were remote.

When this transition to telehealth occurred at our practice site, we recognized that this would allow for some activities that might otherwise only be possible via home visits, such as visually confirming medication storage conditions and clarifying details about over-the-counter (OTC) medications or supplements that patients had not previously been provided in the clinic setting. Additional description of how these assessments were made can be found in [Table 1](#).

**Evaluation methods**

We collected prospective, observational data on the implementation of a virtual medication tour with a pharmacist during CF clinic appointments conducted over telehealth. Participation in this activity was offered as a standard of care to all patients of the adult CF clinic. This project was formally determined to be quality improvement, not human subjects research, and was therefore not overseen by the institutional review board, per institutional policy. It was approved by the Department Quality Chief and the organization's Chief Quality Improvement Reviewer.

This was conducted at the Adult Cystic Fibrosis Care Center at the University of Chicago Medicine, a small CF care center (<100 patients in the CF Foundation Patient Registry<sup>16</sup>) within a large academic medical center in the South Side of Chicago, IL. This CF care center is unique in terms of its relatively high proportion of nonwhite CF patients (14% Black, 8% Hispanic). Patients come from varied socioeconomic status, with about 68% of patients covered by commercial payers and the remainder covered by Medicaid, Medicare, or International Embassy as their primary payer. The adult clinic operates half a

**Table 1**  
Virtual medication tour components and assessment process

Component	Method of assessment
Medications secured away from children	<ul style="list-style-type: none"> <li>The pharmacist confirmed whether or not there were children &lt;12 y of age living in the household. <ul style="list-style-type: none"> <li>If yes, the pharmacist clarified with the patient if children were able to reach the location(s) where medications were stored.</li> <li>If no, N/A.</li> </ul> </li> </ul>
Medications stored appropriately for temperature	<ul style="list-style-type: none"> <li>The pharmacist confirmed whether or not refrigerated medications were stored in a refrigerator and room temperature medications were stored in ambient household air. This was recorded as appropriate or not appropriate. <ul style="list-style-type: none"> <li>Because of lack of access to formal or consistent temperature monitoring in patients' home environments, location within a refrigerator generally was sufficient to be considered appropriate.</li> <li>The pharmacist did provide education on increased likelihood of temperature variability if medications were stored on a refrigerator door or immediately below or adjacent to a cooling device, but these were still documented as appropriate storage.</li> </ul> </li> </ul>
Medications stored appropriately for humidity	<ul style="list-style-type: none"> <li>The pharmacist confirmed that medications were not stored in a bathroom or directly above or adjacent to a steam-generating appliance (e.g., dishwasher, humidifier). If these location criteria were met, this was sufficient to be considered appropriate</li> </ul>
Medications stored appropriated in terms of light exposure	<ul style="list-style-type: none"> <li>The pharmacist confirmed that all light-sensitive medications were stored in either original packaging or an opaque organization system.</li> </ul>
Medication organization system	<ul style="list-style-type: none"> <li>The pharmacist confirmed whether the patient was able to verbally describe and show their specific system for organizing medications, and this included use of weekly or monthly medication organizers, carts, and cabinet systems.</li> </ul>
Medication reconciliation <ul style="list-style-type: none"> <li>All medications on hand</li> <li>Clarified incomplete details for OTC product or supplement entries in the EMR</li> <li>Discrepancies between medication list and current medications</li> </ul>	<ul style="list-style-type: none"> <li>The pharmacist visualized each medication listed on the EMR. The patient confirmed that any medications they were taking was physically present and showed these to the pharmacist on the video screen.</li> <li>The pharmacist asked the patient to visualize bottles or boxes of OTC medications, vitamins, and supplements that had not been obtained through a prescription. This was done by the patient holding the original packaging up to the camera.</li> <li>In this sample, there were zero instances of loose tablets or capsules needing to be identified through a drug ID software program.</li> </ul>

Abbreviations used: N/A, not applicable; EMR, electronic medical record; OTC, over-the-counter; ID, identification.

day each week, alternating between Thursday mornings and Friday afternoons. Patients are seen by the full CF care team at least once annually and by most team members at each of their quarterly visits. The CF care team includes a physician, advanced practice nurse, nurse coordinator, respiratory therapist, registered dietitian, social worker, physical therapist, and pharmacist. A pharmacy technician was recently added to the team and may join the pharmacist during a visit upon request but is not routinely scheduled for one-on-one time with the patient during a visit. Physician, dietitian, and pharmacist learners (e.g., students, residents, fellows) occasionally attend this clinic and are directly supervised by the licensed individual of that discipline. This in-person model was maintained with the conversion to telehealth, with a patient seeing multiple CF care team members during 1 scheduled visit rather than asynchronous visits with each discipline. Because the CF care team was not centrally located in 1 workroom and was unable to visualize when another team member had completed their assessment, a specific schedule was distributed to team members by the nurse coordinator before each clinic day to guide the clinic flow (Figure 1). The virtual medication tour was able to be completed without extending the 15-minute scheduled time with the pharmacist and without dedicating additional pharmacist resources.

Patients 18 years and older were asked by a pharmacist or student pharmacist to provide a virtual tour of their medications during the visit. Baseline demographic and clinical data including age, sex, race, cystic fibrosis transmembrane conductance regulator gene mutation, number of medications listed in the electronic medical record (EMR) before the start of

the visit, and whether there was incomplete information (e.g., dose, strength, frequency) for any medication or supplement listed on the EMR were collected for all patients asked to complete a virtual medication tour. Patients who were willing to complete the tour were prompted to show all areas of the home where medications were stored via webcam, cellular phone camera, or other device being utilized for the telehealth appointment. The pharmacist evaluated whether storage conditions were appropriate. This included determining if medications were within reach of children and if medications appeared to be stored appropriately in regard to temperature, humidity, and light exposure. The pharmacist also noted whether or not a medication organization system was utilized. This term included weekly or monthly medication organizers as well as larger dedicated medication bin, drawer, or cabinet systems to contain therapies too large for weekly or monthly medication organizers. In addition to collecting data on storage conditions, the pharmacist also noted whether or not the patient had all necessary medications on hand as well as any discrepancies between the medications at home and the current medication list in the EMR. Updates were made to the medication list in case of any incomplete or inaccurate entries.

Study data were collected and managed using Research Electronic Data Capture (REDCap Vanderbilt, Norwalk, CT) electronic data capture tools hosted at University of Chicago Medicine.<sup>17,18</sup> REDCap is a secure, Web-based software platform designed to support data capture for research studies. This was exported to Microsoft Excel, version 14 (Microsoft Corporation, Redmond, VA), for analysis. Descriptive statistics were used on the basis of the nature of the project, with

Day of the week, month-date-year

	Respiratory therapist	Physical therapist	Registered dietitian	Clinical pharmacist	Nurse coordinator	Social worker	Physician 1	Physician 2	Advanced nurse practitioner
9am: Patient #1 Phone no	9:00 - 9:15	10:00 - 10:15	9:15 - 9:30	9:30 - 9:45	9:45 - 10:00	10:15 - 10:30	10:30 - 10:50		
9:30am: Patient #2 Phone no	10:00 - 10:30	10:30 - 10:45	10:45 - 11:00	11:00 - 11:15				9:30 - 10:00	
10 am: Patient #3 Phone no	11:00 - 11:15	10:45 - 11:00	10:15 - 10:30	10:30 - 10:45		10:00 - 10:15			11:15 - 11:35
10 am: Patient #4 Phone no	10:30 - 11:00	11:15 - 11:30				11:00 - 11:15		10:00 - 10:30	
10 am: Patient #5 Phone no	11:20 - 11:35	11:35 - 11:50	10:00 - 10:15	10:15 - 10:30	10:45 - 11:00	10:30 - 10:45	11:00 - 11:20		
10:30 am: Patient #6 Phone no	11:40 - 11:55	11:00 - 11:15	10:30 - 10:45	10:45 - 11:00	11:15 - 11:25	11:25 - 11:40			11:55 - 12:15

Legend:

	Telephone visit
	Video visit
	In-person visit

Telephone visit guidelines:

- \*Ancillary staff are 15-min calls
- \*Providers are 20-min calls
- \*5-minute buffers between calls

Video visit guidelines:

- \*Ancillary staff are 15-min calls
- \*Providers are 20-min calls
- \*No buffers between calls

Figure 1. Telehealth clinic schedule example.

median and range selected owing to the small sample and non-normal distribution.

**Results**

A total of 20 patients were seen via telehealth for a CF clinic appointment between April and June 2020. Baseline demographic information on all patients is available in Table 2. Of the 13 patients who were willing to participate in a virtual medication tour, the median number of unique medications per patient was 17, as compared with a median of 10 medications for those patients who declined the virtual tour. All patients with incomplete details for 1 or more entries in the electronic medical record (EMR) medication list at the start of the visit did agree to participate in virtual tour. This included vitamins or other products or supplements purchased OTC or through specialty retailers of health and wellness products with missing ingredient or dose information on the patient's medication list in the EMR. None of the patients seen during this time period had any prescription medications listed in the EMR with missing ingredient or dose information. Most patients who declined to participate in the virtual medication tour were not at their primary residence where medications were stored during the telehealth visit, but reason for declining to participate was not part of the original data collection tool and therefore, was not consistently noted during this pilot.

Opportunities for pharmacist intervention based on virtual medication tour findings are presented in Table 3. In terms of medication storage, we identified that 3 of the 4 participating

patients with a child under 12 years old in the household had medications stored in a place accessible to children. All patients had their medications stored in the correct setting with respect to temperature requirements. However, the pharmacist did provide guidance on preferred locations for medications within the refrigerator, such as not using a door because of potential for higher temperature variability and not storing medication direct below a cooling element because of risk of freezing. Only 1 patient had a medication stored inappropriately with respect to potential for exposure to light. They were advised to store the medication in the original packaging or alternative light-protective container moving forward. Overall, 86.4% of patients were utilizing some style of medication organization system. On the basis of the large number of medications that the patients needed to store in addition to other equipment, such as nebulizer supplies and nutritional supplements, patients more commonly opted for plastic stacking bins, baskets, or rolling carts as part of their storage strategy as opposed to medication organizers or other more traditional strategies.

Information about 1 or more OTC products or supplements was missing from the medication list at the start of 25% of telehealth visits. A virtual medication tour allowed for resolution of this information 80% of the time. Patients were prompted to show the original container and ingredient list for these vitamins and supplements. In 1 instance, the OTC product was blurry when shared over the screen and could not be read by the pharmacist after several attempts by the patient to improve the image resolution by increasing or decreasing the space between the container and camera. The patient was



**Table 2**  
Patient baseline demographics and clinical characteristics

Demographics and characteristics	Patients seen via telehealth for CF clinic appointment (N = 20)	
	Participated in virtual medication tour (n = 13)	Declined virtual medication tour (n = 7)
Age (y), median (range)	29 (20–38)	32 (19–67)
Sex (male), n (%)	6 (46.2)	5 (71.4)
Race, n (%)		
White	13 (100)	5 (71.4)
Black	0 (0)	2 (28.6)
Other	0 (0)	0 (0)
CFTR gene mutation, n (%)		
Homozygous F508del	5 (38.5)	1 (14.3)
Heterozygous F508del	6 (46.2)	4 (57.1)
Other	2 (15.4)	2 (28.6)
No. of medications, median (range)	17 (9–32)	10 (7–19)
Incomplete details for one or more entries in the EMR medication list (yes), n (%)	5 (38.5)	0 (0)

Abbreviations used: CFTR, cystic fibrosis transmembrane conductance regulator; EMR, electronic medical record.

not able to find this information on the bottle, despite the pharmacist providing direction. Other discrepancies between the medication list and home medication regimen were identified during only 1 visit.

### Practice implications

Our initial findings demonstrate that a virtual medication tour led by a pharmacist can be successfully incorporated into telehealth visits and be accepted by a majority of patients. Of those who did not participate, most attributed this to being in an alternative location during the telehealth visit, such as office or workplace, or quarantining at another household during the COVID-19 pandemic where they felt medication storage and organization did not accurately reflect their usual practices or habits. One limitation of our study is that we did not prospectively collect the location of patients during their telehealth visit. However, this was often noted in the comments section of the data collection form for patients who declined, so we were able to identify that this was a factor in at least half of these cases. A potential solution to overcome this barrier for some patients would be to offer a separate follow-up telehealth visit with a pharmacist at a later date; however, this was not part of our initial study design approved through the quality improvement determination process and would require additional pharmacist training on scheduling telehealth visits through the organization's secure system or support from clinic staff with scheduling privileges.

The pharmacist asking patients to participate in these tours was not blinded to their medication lists before the start of a visit because they were a long-standing member of the CF care team. This may have introduced unintended bias, because highlighting missing information on a medication list may have made patients more likely to agree to a virtual medication tour, or the pharmacist may have been more assertive in their prompting with patients who had a longer medication list in EMR. In addition, it is possible that long-standing presence of the pharmacist in clinic and the relationships and rapport they had developed with each of the patients over the approximately 5 years before this study may have increased the likelihood that patients would have shared various areas of their homes over video during the visits. Patients with a greater number of total medications may have

also have a greater number of prior interactions with the pharmacist outside of clinic time for telephone counseling on newly approved medications or assistance with medication access. This could have introduced additional bias and resulted in patients with a greater number of medications participating more frequently than their peers with less total medications. These results may differ at CF care centers that have more recently added a pharmacist presence in the clinic setting or where pharmacists are given less dedicated time to see patients at these visits. We did not collect data on whether a learner was also present during the visit and if that learner was present, whether the learner or pharmacist initiated the request to complete a virtual medication tour. This may have been helpful in assessing the impact of a pre-existing relationship with the CF care team member on whether a patient is willing to participate in this activity.

Another possible bias in our study related to the history of consistent pharmacist presence in this clinic is that all patients had previously had their medication lists in the EMR reviewed multiple times over multiple years by a pharmacist with expertise in CF. This may have reduced the number of medication list corrections or changes and potential interventions compared with clinics that do not have historical pharmacist involvement.

On the basis of pharmacist observations during virtual medication tours, most patients were already properly storing medications for stability, but because these assessments were made only through visualizing the storage locations and did not include formal temperature or humidity measurements, the authors felt patients still might benefit from targeted education surrounding variation of temperature within refrigerators, light sensitivity of certain medications, and in particular, ability of children or pets to inappropriately gain access to supplies. This finding is consistent with previous research suggesting that only 25% of caregivers store their prescription medications in a secure place.<sup>19</sup> Future plans include providing a poison prevention education day via webinar to patients and families based on these findings.

Our study is further limited by the relatively small sample size, lack of a comparator group, and subsequent inability to do a more robust statistical analysis. Although our adult CF care center would be considered small by CF Patient Registry<sup>20</sup> standards (<100 patients), this still represents less than

**Table 3**  
Virtual medication tour storage conditions and opportunities for pharmacist intervention

Component assessed	Patients who participated in a virtual medication tour (n = 13)
Medications secured away from children, n (%)	
Yes	1 (7.7)
No	3 (23.1)
N/A	9 (69.2)
Medications stored appropriately for temperature (yes), n (%)	13 (100)
Medications stored appropriately for humidity (yes), n (%)	13 (100)
Medications stored appropriately in terms of light exposure (yes), n (%)	12 (92.3)
Medication organization system utilized (yes), n (%)	8 (61.5)
All medications on hand (yes), n (%)	13 (100)
Clarified incomplete details for OTC products or supplement entries in the EMR, n (%)	
Yes	4 (30.8)
No	1 (7.7)
N/A	8 (61.5)
Discrepancies between medication list and current medications? (yes), n (%)	1 (7.7)

Abbreviations used: EMR, electronic medical record; OTC, over-the-counter.

one-third the total number of patients seen at our CF care center. According to CF Foundation guidelines, all patients should be seen at least quarterly by their pulmonologist. There were multiple factors that may have contributed to this small sample, including patients either delaying or skipping quarterly visits during this time frame or being seen in-person instead, either because of a CF exacerbation needing in-person evaluation, or being seen later in the study time frame on the basis of patient preference for an in-person visit as additional timeslots in the clinic became available in late May and June 2020.

We did not assess patient satisfaction with telehealth or with the virtual medication tour process specifically. Findings at other CF centers suggest that patients and families are most concerned with lack of physical exam and pulmonary function testing but that patient-reported benefits include reduced time spent traveling, reduced time away from school or work, and reduced risk of infection.<sup>21</sup> Overall, patient satisfaction with telehealth is high. We anticipate that this style of appointment will continue to be offered, and it will be important to define roles for CF care team members in this setting.

Further studies would be needed to examine the feasibility and impact of such an intervention in other patient populations. As mentioned above, the strong rapport that pharmacists in the CF community have with their patients may impact the uptake of virtual medication tours in this specific clinic.

Another consideration not incorporated in this project but potentially valuable in this and in other patient populations could be demonstration of and coaching on medication administration technique. There is robust evidence that

inhaler technique is poor in children with asthma but improves with adequate counseling.<sup>22</sup> More broadly in pediatrics, there is known to be a gap between perceived and demonstrated understanding of medication administration, with 98% of caregivers of children with complex medication regimens reporting confidence measuring with a syringe, but only approximately two-third being able to demonstrate it accurately.<sup>23</sup> Depending on the patient population, specific medications could be targeted for a demonstration during a virtual medication tour. Other examples might be prompting patients with chronic rhinosinusitis to show nasal spray technique or patients with atopic dermatitis to show amount of a steroid cream used per application.

Finally, the short duration of this study and lack of re-assessment of medication storage conditions on follow-up visits, small sample size, and infrequent incidence of inappropriate medication storage prevent us from providing a meaningful assessment of the impact of these interventions at this time. We identified no new drug–drug interactions and no dangerous OTC product and supplement use. Larger studies conducted over a longer period of time or with a higher rate of pharmacist interventions would be needed to describe potential benefits of virtual medication tours more robustly in terms of medication safety.

Despite our inability to demonstrate a broader impact on medication safety with virtual medication tours in this study, the ease of incorporating them into telehealth visits for our clinic without adding additional pharmacist time or time to the overall visit made them well-received by the team, and our pediatric CF center care team has requested that this same pharmacist assessment be performed for pediatric patients participating in telehealth visits.

## Conclusion

A virtual medication tour led by a pharmacist can be successfully incorporated into telehealth visits and allows pharmacists to identify opportunities for intervention. Although a majority of patients stored medications appropriately, we identified that our patients were not using adequate poison prevention practices. This will be a future target for pharmacist intervention through education at both our pediatric and adult CF care centers.

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